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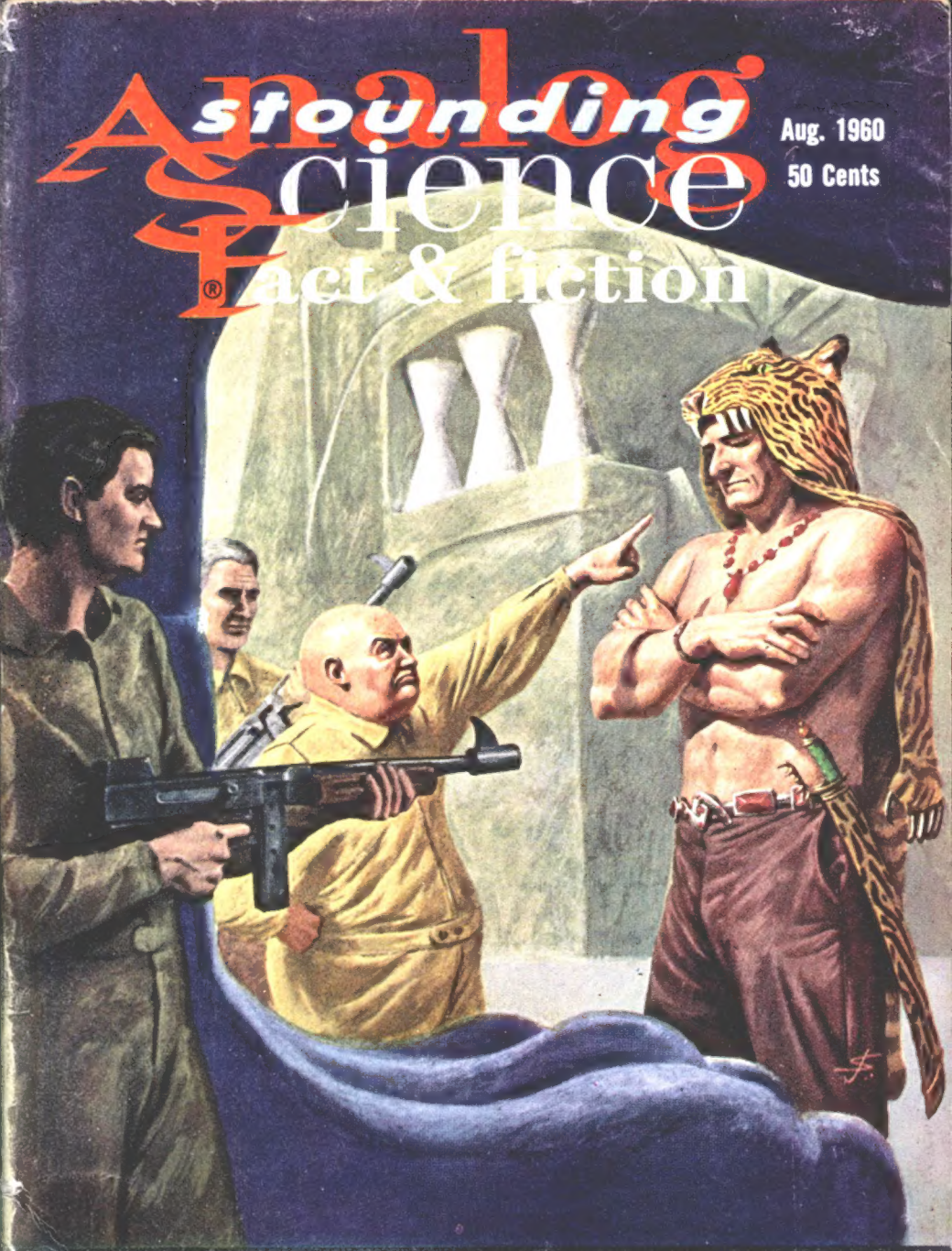
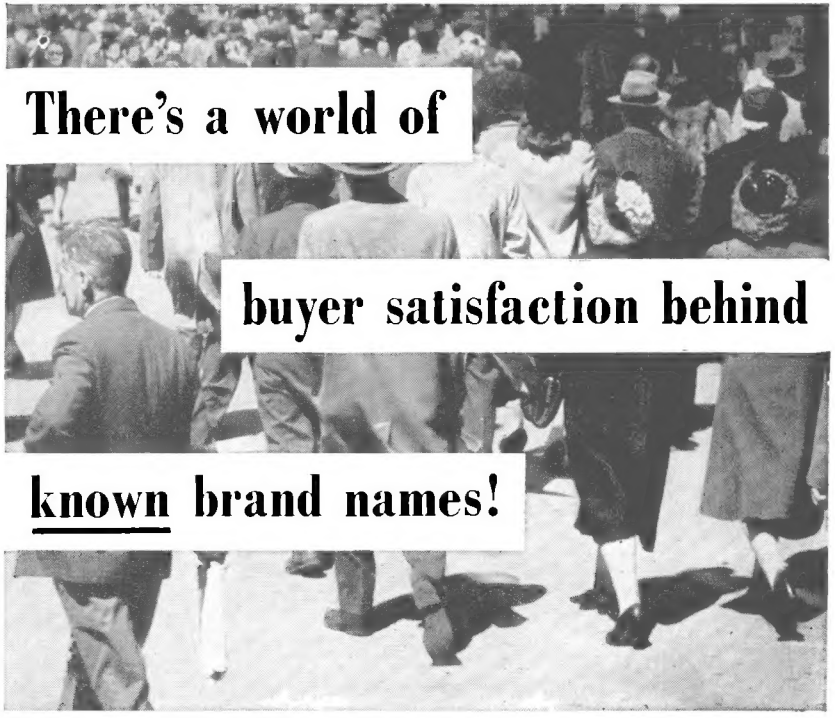


ADAPTATION, By Mack Reynolds



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PEOPLE NEED HELP

ONE of the accepted axioms of our current culture is that "People need, and deserve, help."

As stated, that "intuitively obvious" axiom is, flatly, wrong—as wrong as saying "Since there is an infinite number of points on a line, all points lie on the same line."

But you can get into some magnificent hooraws if you try to discuss the proposition; there's more red-hot, violent emotionalism tied up in that one than there is, today, in religious arguments.

The reason's very simple: no one is willing to set up a definition for three terms invloved: "want," "need," and "help"—largely, I suspect, on the grounds that "anything I say may be used against me, when I 'need help'."

The greatest difference between "need" and "want" is that "need" is usually used with respect to an objective—or claimed-to-be-objective—situation, and is finite, terminable. But "want" usually refers to a subjective system, and is interminable. A hungry man *needs* food—but there's a limit to how much he will accept. A miser *wants* money—and the want is insatiable.

There are, of course, subjective-reality needs, just as there are objective-level needs. The huge sums spent annually on entertainment are definite demonstration of a subjective-level *need* for something; human beings don't continue to sacrifice economic wealth for no reward.

The trouble is, there is no measure of subjective reality; peace-of-mind is as much a need of the human subjective-level organism, as relaxation is to a muscle.

Of course everyone knows that there's such a thing as too much muscle-relaxation, leading to flabbiness—but the concept of excessive peace-of-mind doesn't exist. The result has very—and very dangerous—practical results; since peace-of-mind is equated with security, if there can be no such thing as too much peace-of-mind, then there is no such thing as too much security. Like a miser's want for money, the want for security is insatiable.

The result is typified by a poster appearing around New York City:

DISCRIMINATION HURTS!
HELP END PREJUDICE.

Look, friends; if a woman shows a lack of discrimination, we have a special, and highly uncomplimentary term for her. Even a prostitute shows some discrimination; she gives her favors only to those who pay her; the woman who doesn't have even that much discrimination earns a different term.

Of course it does hurt a man's ego to have a woman discriminate against him. So? So what? Maybe he deserves it, huh? So it hurts; what does that prove? That it's evil, improper, unethical? In that case dentistry, which hurts, is evil, improper, and unethical, and we should all Help End Dentistry. Morphine, on the other hand, definitely does *not* hurt; it's an anodyne, and not only does not hurt of itself, but interferes with the hurt other things cause. So, if we reason that "That which hurts is Evil, and that which ends hurt is Good," then obviously morphine addiction is high-order sanity.

"Hurts" has no relationship whatever to the concept we really have in mind—"hurts" and "injuries" can be totally disrelated. The trouble is, hurt invariably *feels* like injury. But morphine injures painlessly, while dentistry cures injury hurtfully.

Finally, there never was, is not, and never will be, anywhere or anywhen in all space-time, any culture of intelligent entities that was not founded on prejudice, discrimination, and hurt.

The reason is simple: in fundamental analysis, prejudice means simply "pre-judged"—determined beforehand. The essence of any code of morals, laws, or tribal traditions is a publicly stated system of prejudices. We are prejudiced against murderers; we define the prejudice even closer than that. Dobu Islanders, I understand, hold an accomplished murderer in high esteem; in earlier western cultures, dueling was not defined as murder. Our prejudices change. But the very basis of anything we call "a culture" is a pattern of allowed vs. disallowed behavior; that pattern is, necessarily, a code of prejudices. The Mosaic Laws of the Jews were simply a carefully drawn set of prejudices.

Justice Holmes, who was long claimed by the Liberals as their own, repeatedly exasperated the Liberals by his insistence that Law had no meaning without Power—that the power to enforce was the essence of really functioning Law.

Discrimination based on prejudice is the function of the courts; hurt—application of pain—is the necessary function of the police power, without which the courts, and hence the culture itself, has no meaning.

Fundamentally, then, that New York City poster can be translated:

Police Power Hurts!
Help Overthrow Law and Justice!

O.K.—so that isn't what they

meant. *But that's what they said!* It's what the Juvenile Delinquent feels is true, because police power—discrimination—hurts. He hates discipline.

Now let's take a little further look at how to "help" someone. The JD wants someone to help him get away with defying the discrimination of the courts, and the hurtful power of the police. The drug addict, who discovers that all the dope peddlers he knows have just been picked up by the police, may be forced to go to a doctor for help. And what he *wants* in the form of "help" is neither what he *needs* nor what the doctor is apt to offer.

Wherefore he'll be furiously angry at the doctor for not only refusing to "help" him, but for forcing him against his will—blackmailing him by taking advantage of his terrible need for his drug—to submit to withdrawal.

Note that it is perfectly normal-human reaction for a child to loathe having a dentist work on an aching tooth—and vastly prefer an injection of morphine that numbs the pain. In the child's terms, the morphine-injection is real help; that's what he wants. The drilling he *needs* rates as the very opposite of help—it hurts even more than the ache. So his motto, quite understandably, is, "Drilling hurts! Help end Dentistry!"

It all comes down to a very simple, and thoroughly obnoxious, principle. Discrimination is essential to living; discrimination is itself futile, if it is not backed up by some form of police power. Nobody likes to be judged, and have the judgments enforced; anything that hurts *feels* injurious. And each of us, invariably, has a deep conviction that "I know what I need better than anyone else!"

And the greatest of all felt-needs—the thing that feels far and away the most absolutely necessary—is freedom to choose.

So the child chooses morphine anodyne; he knows that's better for him than that snarling dental drill.

Immediately, if he gets his free-will choice, the great difference between *need* and *want* shows up. The drilling he *needs* is quantitative, and terminable. If he gets the anodyne he *wants*, he begins a divergent infinite series, in strict mathematical terms. Each dose must be slightly larger than the last, to have equal effect, and the only termination is death.

No human being, whether child, adult, idiot or genius, can ever *feel* that his free-will choice is wrong. If he did, by definition, he would make a different choice! Unfortunately, there is a tremendously strong correlation between "hurts" and "I choose not," and practically no predictable correlation between "hurts" and "injurious."

The consequence is that if Alpha helps Omega by doing a beneficial, contra-injurious thing, he may earn Omega's undying hatred, while if Beta does a lethally injurious thing, Omega may bless him to his dying day.

And now let us consider the United States' Foreign Aid problems—and our State Department's problems.

Our intervention in the dispute between Britain and France on one side, and Egypt on the other, is a fine case in point. Who were we helping? Nasser, who, we have publicly stated, is objectionably dictatorial, against our democratic friends Britain and France? A non-European power against ex-Colonial powers, in a grand-stand play for the affection of the ex-colonies around the world?

Personally, I don't know what the purpose was—but I know several of the results. The most interesting, I think, is the lovely shemozzle brewing in Panama. The Egyptian government, if you recall, had abrogated the treaties concerning the Suez Canal; the United States nobly backed their claim that they had a right to do so. That a nation had a right to abrogate international treaties concerning a vital canal without being forcefully punished.

Currently, Panama is anything but pleased with the United States. From some personal accounts I've heard of the attitudes of United States military personnel in the Canal Zone, I gather that we've earned the Panamanian's distate. Our Navy may not be happy about the Canal . . .

Now it happens that Nasser & Co. are definitely dictatorial-authoritarian in their internal methods. I was talking to one of the senior departmental heads of the Nasser government, and learned something of the way they operate. The Army is, quite frequently, sent into a town, and the children are forcibly taken from their parents, and imprisoned in schools.

The primitive and uneducated *fellahin* of Egypt, have never had education, don't want education, and flatly refuse to allow their children to be educated. The children, like most children, don't like schools. The problem is not unlike that the United States had with some of the backwoods Kentucky mountaineers; the parents have no use for that dang' "book-larnin' ", and don't intend to have their kids subjected to it.

The only solution—like the solution to the problem of a child's aching tooth—is dictatorial-authoritarian force. What the *fellahin* want is precisely what they *need* to give up. And only by raw, direct force can it be accomplished.

Note that if a democratic vote were taken in the affected villages the Nasser government would be overwhelmingly defeated.

Another project being carried out by ramming it down the throats of the people with bayonets and light tanks is sanitation. They do not approve of the dictatorial-authoritarian imposition of new rules about digging wells, and where latrines may and may not be placed. It's an infringement on their ancient rights of free choice.

Go ahead and give the people the help they need—there's no question whatever that these people need help. And they'll murder you for imposing it, if they have half a chance.

(*Continued on page* 175)

ADAPTATION

By
MACK
REYNOLDS

Illustrated by Schoenherr

When a man has a great deal of knowledge, it becomes extremely easy for him to confuse "knowledge" with "wisdom"... and forget that the antonym of "wisdom" is not "ignorant" but "folly."

FORWARD

Hardly had man solved his basic problems on the planet of his origin than he began to fumble into space. Barely a century had elapsed in the exploration of the Solar System than he began to grope for the stars.

And suddenly, with an all but religious zeal, mankind conceived its fantasy dream of populating the galaxy. Never in the history of the race had fervor reached such a peak and held so long. The question of why was seemingly ignored. Millions of Earth-type planets beckoned and with a lemming-like desperation humanity erupted into them.

But the obstacles were frightening in their magnitude. The planets and satellites of Sol had proven comparatively tractable and those that were suited to man-life were quickly brought under his dominion. But there, of course, he had the advantage of proximity. The time involved in running back and forth to the home planet was meaningless and all Earth's resources could be thrown into each problem's solving.

But a planet a year removed in transportation or even communication? Ay! this was another thing and more than once a million colonists were lost before the Earthlings could adapt to new climates, new flora and fauna, new bacteria—or to factors which the most far out visionary had never fancied, perhaps the lack of something never before missed.

So, mad with the lust to seed the universe with his kind, men sought new methods. To a hundred thousand worlds they sent smaller colonies, as few as a hundred pioneers apiece, and there marooned them, to adapt, if adapt they could.

For a millennium each colony was left to its own resources, to conquer the environment or to perish in the effort.

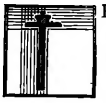
A thousand years was sufficient. Invariably it was found, on those planets where human life survived at all, man slipped back during his first two or three centuries into a state of barbarism. Then slowly began to inch forward again. There were exceptions and the progress on one planet never exactly duplicated that on another, however the average was surprisingly close to both nadir and zenith, in terms of evolution of society.

In a thousand years it was deemed by the Office of Galactic Colonization such pioneers had largely adjusted to the new environment and were ready for civilization, industrialization and eventual assimilation into the rapidly evolving Galactic Commonwealth.

Of course, even from the beginning, new and unforeseen problems manifested themselves . . .

from "Man In Antiquity"
published in Terra City, Sol Galactic Year 3,502.

I.



THE Co-ordinator said, "I suppose I'm an incurable romantic. You see, I hate to see you go." Academecian Amschel Mayer was a man in early middle years; Dr. Leonid Plekhanov, his contemporary. They offset one another; Mayer thin and high pitched, his colleague heavy, slow and dour. Now they both showed their puzzlement.

The Co-ordinator added, "Without me."

Plekhanov kept his massive face blank. It wasn't for him to be impatient with his superior. Nevertheless, the ship was waiting, stocked and crewed.

Amschel Mayer said, "Certainly a last minute chat can't harm." Inwardly he realized the other man's position. Here was a dream coming true, and Mayer and his fellows were the last thread that held the Co-ordinator's control over the dream. When they left, half a century would pass before he could again check developments.

The Co-ordinator became more businesslike. "Yes," he said, "but I have more in mind than a chat. Very briefly, I wish to go over your assignment. Undoubtedly redundant, but if there are questions, no matter how seemingly trivial, this is the last opportunity to air them."

What possible questions could there be at this late date? Plekhanov thought.

The department head swiveled slowly in his chair and then back again as he talked. "You are the first —the first of many, many such teams. The manner in which you handle your task will effect man's eternity. Obviously, since upon your experience we will base our future policies on interstellar colonization." His voice lost volume. "The position in which you find yourselves should be humbling."

"It is," Amschel Mayer agreed. Plekhanov nodded his head.

The Co-ordinator nodded, too. "However, the situation is as near ideal as we could hope. Rigel's planets are all but unbelievably Earthlike. Almost all our flora and fauna have been adaptable. Certainly our race has been.

"These two are the first of the seeded planets. Almost a thousand years ago we deposited small bodies of colonists upon each of them. Since then we have periodically checked, from a distance, but never intruded." His eyes went from one of his listeners to the other. "No comments or questions, thus far?"

Mayer said, "This is one thing that surprises me. The colonies are so small to begin with. How could they possibly populate a whole world in one millennium?"

The Co-ordinator said, "Man adapts, Amschel. Have you studied the development of the United States? During her first century and a half the need was for population to fill the vast lands wrested from the Amer-Inds. Families of eight, ten, and twelve children were the com-

mon thing, much larger ones were not unknown. And the generations crowded one against another; a girl worried about spinsterhood if she reached seventeen unwed. But in the next century? The frontier vanished, the driving need for population was gone. Not only were drastic immigration laws passed, but the family shrunk rapidly until by mid-Twentieth Century the usual consisted of two or three children, and even the childless family became increasingly common."

Mayer frowned impatiently, "But still, a thousand years. There is always famine, war, disease . . ."

Plekhanov snorted patronizingly. "Forty to fifty generations, Amschel? Starting with a hundred colonists? Where are your mathematics?"

The Co-ordinator said, "The proof is there. We estimate that each of Rigel's planets now supports a population of nearly one billion."

"To be more exact," Plekhanov rumbled, "some nine hundred million on Genoa, seven and a half on Texcoco."

Mayer smiled wryly, "I wonder what the residents of each of these planets call their worlds. Hardly the same names we have arbitrarily bestowed."

"Probably each call theirs *The World*," the Co-ordinator smiled. "After all, the basic language, in spite of a thousand years, is still Amer-English. However, I assume you are familiar with our method of naming. The most advanced culture on Rigel's first planet is to be compared to the Italian cities during Europe's feudalistic era. We have named that planet Genoa. The most advanced nation of the second planet is comparable to the Aztecs at the time of the conquest. We considered Tenochtitlán but it seemed a tongue twister, so Texcoco is the alternative."

"Modernizing Genoa," Mayer mused, "should be considerably easier than the task on semiprimitive Texcoco."

Plekhanov shrugged, "Not necessarily."

The Co-ordinator held up a hand and smiled at them. "Please, no debates on methods at present. An hour from now you will be in space with a year of travel before you. During that time you'll have opportunity for discussion, debate and hair pulling on every phase of your problem."

His expression became more serious. "You are acquainted with the unique position you assume. These colonists are in your control to an extent no small group has ever dominated millions of others before. No Caesar ever exerted the power that will be in your educated hands. For a half century you will be as gods. Your science, your productive know-how, your medicine—if it comes to that, your weapons—are many centuries in advance of theirs. As I said before, your position should be humbling."

Mayer squirmed in his chair. "Why not check upon us, say, once every decade? In all, our ship's company numbers but sixteen persons. Almost anything could happen. If you were

to send a department craft each ten years . . ."

The Co-ordinator was shaking his head. "Your qualifications are as high as anyone available. Once on the scene you will begin accumulating information which we, here in Terra City, do not have. Were we to send another group in ten years to check upon you, all they could do would be interfere in a situation all the factors with which they would not be cognizant."

Amschel Mayer shifted nervously. "But no matter how highly trained, nor how earnest our efforts, we still may fail." His voice worried. "The department cannot expect guaranteed success. After all, we are the first."

"Admittedly. Your group is first to approach the hundreds of thousands of planets we have seeded. If you fail, we will use your failure to perfect the eventual system we must devise for future teams. Even your failure would be of infinite use to us." He lifted and dropped a shoulder. "I have no desire to undermine your belief in yourselves but—how are we to know? —perhaps there will be a score of failures before we find the ideal method of quickly bringing these primitive colonies into our Galactic Commonwealth."

The Co-ordinator came to his feet and sighed. He still hated to see them go. "If there is no other discussion . . ."

II.

Specialist Joseph Chessman stood stolidly before a viewing screen. Theoretically he was on watch. Actually his eyes were unseeing, there was nothing to see. The star pattern changed so slowly as to be all but permanent.

Not that every other task on board was not similar. One man could have taken the *Pedagogue* from the Solar System to Rigel, just as easily as its sixteen hand crew was doing. Automation at its ultimate, not even the steward department had tasks adequately to fill the hours.

He had got beyond the point of yawning, his mind was a blank during these hours of duty. He was a stolid, bear of a man, short and massive of build.

A voice behind him said, "Second watch reporting. Request permission to take over the bridge."

Chessman turned and it took a brief moment for the blankness in his eyes to fade into life. "Hello Kennedy, you on already? Seems like I just got here." He muttered in self contradiction, "Or that I've been here a month."

Technician Jerome Kennedy grinned. "Of course, if you want to stay . . ."

Chessman said glumly, "What difference does it make where you are? What are they doing in the lounge?"

Kennedy looked at the screen, not expecting to see anything and accomplishing just that. "Still on their marathon argument."

Joe Chessman grunted.

Just to be saying something, Ken-

nedy said, "How do you stand in the big debate?"

"I don't know. I suppose I favor Plekhanov. How we're going to take a bunch of savages and teach them modern agriculture and industrial methods in fifty years under democratic institutions, I don't know. I can see them putting it to a vote when we suggest fertilizer might be a good idea." He didn't feel like continuing the conversation. "See you later, Kennedy," and then, as an afterthought, formally, "Relinquishing the watch to Third Officer."

As he left the compartment, Jerry Kennedy called after him, "Hey, what's the course!"

Chessman growled over his shoulder, "The same it was last month, and the same it'll be next month." It wasn't much of a joke but it was the only one they had between themselves.

In the ship's combination lounge and mess he drew a cup of coffee. Joe Chessman, among whose specialties were propaganda and primitive politics, was third in line in the expedition's hierarchy. As such he participated in the endless controversy dealing with overall strategy but only as a junior member of the firm. Amschel Mayer and Leonid Plekhanov were the center of the fracas and right now were at it hot and heavy.

Joe Chessman listened with only half interest. He settled into a chair on the opposite side of the lounge and sipped at his coffee. They were going over their old battlefields, assaulting ramparts they'd stormed a thousand times over.

Plekhanov was saying doggedly, "Any planned economy is more efficient than any unplanned one. What could be more elementary than that? How could anyone in his right mind deny that?"

And Mayer snapped, "*I* deny it. That term *planned economy* covers a multitude of sins. My dear Leonid, don't be an idiot . . ."

"I beg your pardon, sir!"

"Oh, don't get into one of your huffs, Plekhanov."

They were at that stage again.

Technician Natt Roberts entered, a book in hand, and sent the trend of conversation in a new direction. He said, worriedly, "I've been studying up on this and what we're confronted with is two different ethnic periods, barbarism and feudalism. Handling them both at once doubles our problems."

One of the junior specialists who'd been sitting to one side said, "I've been thinking about that and I believe I've got an answer. Why not all of us concentrate on Texcoco? When we've brought them to the Genoa level, which shouldn't take more than a decade or two, then we can start working on the Genoese, too."

Mayer snapped, "And by that time we'll have hardly more than half our fifty years left to raise the two of them to an industrial technology. Don't be an idiot, Stevens."

Stevens flushed his resentment.

Plekhanov said slowly, "Besides,

I'm not sure that, given the correct method, we cannot raise Texcoco to an industrialized society in approximately the same time it will take to bring Genoa there."

Mayer bleated a sarcastic laugh at that opinion.

Natt Roberts tossed his book to the table and sank into a chair. "If only one of them had maintained itself at a reasonable level of development, we'd have had help in working with the other. As it is, there are only sixteen of us." He shook his head. "Why did the knowledge held by the original colonists melt away? How can an intelligent people lose such basics as the smelting of iron, gunpowder, the use of coal as a fuel?"

Plekhanov was heavy with condescension. "Roberts, you seem to have entered upon this expedition with a lack of background. Consider. You put down a hundred colonists, products of the most advanced culture. Among these you have one or two who can possibly repair an I.B.M. machine, but is there one who can smelt iron, or even locate the ore? We have others who could design an automated textile factory, but do any know how to weave a blanket on a hand loom?

"The first generation gets along well with the weapons and equipment brought with them from Earth. They maintain the old ways. The second generation follows along but already ammunition for the weapons runs short, the machinery imported from Earth needs parts. There is no local economy that can provide such things. The third generation begins to think of Earth as a legend and the methods necessary to survive on the new planet conflict with those the first settlers imported. By the fourth generation, Earth is no longer a legend but a fable . . ."

"But the books, the tapes, the films . . ." Roberts injected.

"Go with the guns, the vehicles and the other things brought from Earth. On a new planet there is no leisure class among the colonists. Each works hard if the group is to survive. There is no time to write new books, nor to copy the old, and the second and especially the third generation are impatient of the time needed to learn to read, time that should be spent in the fields or at the chase. The youth of an industrial culture can spend twenty years and more achieving a basic education before assuming adult responsibilities but no pioneer society can afford to allow its offspring to so waste its time."

Natt Roberts was being stubborn. "But still, a few would carry the torch of knowledge."

Plekhanov nodded ponderously, "For a while. But then comes the reaction against these nonconformists, these crackpots who, by spending time at books, fail to carry their share of the load. One day they wake up to find themselves expelled from the group—if not knocked over the head."

Joe Chessman had been following Plekhanov's argument. He said dourly, "But finally the group conquers

its environment to the point where a minimum of leisure is available again. Not for everybody, of course."

Amschel Mayer bounced back into the discussion. "Enter the priest, enter the war lord. Enter the smart operator who talks or fights himself into a position where he's free from drudgery."

Joe Chessman said reasonably, "If you don't have the man with leisure, society stagnates. Somebody has to have time off for thinking, if the whole group is to advance."

"Admittedly!" Mayer agreed. "I'd be the last to contend that an upper class is necessarily parasitic."

Plekhanov grumbled, "We're getting away from the subject. In spite of Mayer's poorly founded opinions, it is quite obvious that only a collectivized economy is going to enable these Rigel planets to achieve an industrial culture in as short a period as half a century."

Amschel Mayer reacted as might have been predicted. "Look here, Plekhanov, we have our own history to go by. Man made his greatest strides under a freely competitive system."

"Well now . . ." Chessman began.

"Prove that!" Plekhanov insisted loudly. "Your so-called free economy countries such as England, France and the United States began their industrial revolution in the early part of the nineteenth century. It took them a hundred years to accomplish what the Soviets did in fifty, in the next century."

"Just a *moment*, now," Mayer simmered. "That's fine, but the Soviets were able to profit by the pioneering the free countries did. The scientific developments, the industrial techniques, were handed to her on a platter."

Specialist Martin Gunther, thus far silent, put in his calm opinion. "Actually, it seems to me the fastest industrialization comes under a paternal guidance from a more advanced culture. Take Japan. In 1854 she was opened to trade by Commodore Perry. In 1871 she abolished feudalism and encouraged by her own government and utilizing the most advanced techniques of a sympathetic West, she began to industrialize." Gunther smiled wryly, "Soon to the dismay of the very countries that originally sponsored bringing her into the modern world. By 1894 she was able to wage a successful war against China and by 1904 she took on and trounced Czarist Russia. In a period of thirty-five years she had advanced from feudalism to a world power."

Joe Chessman took his turn. He said obdurately, "Your paternalistic guidance, given an uncontrolled competitive system, doesn't always work out. Take India after she gained independence from England. She tried to industrialize and had the support of the free nations. But what happened?"

Plekhanov leaned forward to take the ball. "Yes! There's your classic example. Compare India and China. China had a planned industrial development. None of this free competition nonsense. In ten years time

they had startled the world with their advances. In twenty years—"

"Yes," Stevens said softly, "but at what price?"

Plekhanov turned on him. "At any price!" he roared. "In one generation they left behind the China of famine, flood, illiteracy, war lords and all the misery that had been China's throughout history."

Stevens said mildly, "Whether in their admitted advances they left behind all the misery that had been China's is debatable, sir."

Plekhanov began to bellow an angry retort but Amschel Mayer popped suddenly to his feet and lifted a hand to quiet the others. "Our solution has just come to me!"

Plekhanov glowered at him.

Mayer said excitedly, "Remember what the Co-ordinator told us? This expedition of ours is the first of its type. Even though we fail, the very mistakes we make will be invaluable. Our task is to learn how to bring backward peoples into an industrialized culture in roughly half a century."

The messroom's occupants scowled at him. Thus far he'd said nothing new.

Mayer went on enthusiastically. "Thus far in our debates we've had two basic suggestions on procedure. I have advocated a system of free competition; my learned colleague has been of the opinion that a strong state and a planned, not to say totalitarian, economy would be the quicker." He paused dramatically. "Very well, I am in favor of trying them both."

They regarded him blankly.

He said with impatience, "There are two planets, at different ethnic periods it is true, but not so far apart as all that. Fine, eight of us will take Genoa and eight Texcoco."

Plekhanov rumbled, "Fine, indeed. But which group will have the use of the *Pedagogue* with its library, its laboratories, its shops, its weapons?"

For a moment, Mayer was stopped but Joe Chessman growled, "That's no problem. Leave her in orbit around Rigel. We've got two small boats with which to ferry back and forth. Each group could have the use of her facilities any time they wished."

"I suppose we could have periodic conferences," Plekhanov said. "Say once every decade to compare notes and make further plans, if necessary."

Natt Roberts was worried. "We had no such instructions from the Co-ordinator. Dividing our forces like that."

Mayer cut him short. "My dear Roberts, we were given *carte blanche*. It is up to us to decide procedure. Actually, this system realizes twice the information such expeditions as ours might ordinarily offer."

"Texcoco for me," Plekhanov grumbled, accepting the plan in its whole. "The more backward of the two, but under my guidance in half a century it will be the more advanced, mark me."

"Look here," Martin Gunther said. "Do we have two of each of the basic specialists, so that we can divide the party in such a way that neither planet will miss out in any one field?

Amschel Mayer was beaming at the reception of his scheme. "The point is well taken, my dear Martin, however you'll recall that our training was deliberately made such that each man spreads over several fields. This in case, during our half century without contact, one or more of us meets with accident. Besides, the *Pedagogue's* library is such that any literate can soon become effective in any field to the extent needed on the Rigel planets."

III.

Joe Chessman was at the controls of the space lighter. At his side sat Leonid Plekhanov and behind them the other six members of their team. They had circled Texcoco twice at great altitude, four times at a lesser one. Now they were low enough to spot man-made works.

"Nomadic," Plekhanov muttered. "Nomadic and village cultures."

"A few dozen urbanized cultures," Chessman said. "Whoever compared the most advanced nation to the Aztecs was accurate, except for the fact that they base themselves along a river rather than on a mountain plateau."

Plekhanov said, "Similarities to the Egyptians and Sumerians." He looked over his beefy shoulder at the technician who was photographing the areas over which they passed. "How does our geographer progress, Roberts?"

Natt Roberts brought his eyes up from his camera viewer. "I've got most of what we'll need for a while, sir."

Plekhanov turned back to Chessman. "We might as well head for their principal city, the one with the

pyramids. We'll make initial contact there. I like the suggestion of surplus labor available."

"Surplus labor?" Chessman said, setting the controls. "How do you know?"

"Pyramids," Plekhanov rumbled. "I've always been of the opinion that such projects as pyramids, whether they be in Yucatan or Egypt, are make-work affairs. A priesthood, or other ruling clique, keeping its people busy and hence out of mischief."

Chessman adjusted a speed lever and settled back. "I can see their point."

"But I don't agree with it," Plekhanov said ponderously. "A society that builds pyramids is a static one. For that matter any society that resorts to make-work projects to busy its citizenry has something basically wrong."

Joe Chessman said sourly, "I wasn't supporting the idea, just understanding the view of the priesthoods. They'd made a nice thing for themselves and didn't want to see anything happen to it. It's not the only time a group in the saddle has held up progress for the sake of remaining there. Priests, slave owners, feudalistic barons, or bureaucrats of a twentieth century police state, a ruling clique will never give up power without pressure."

Barry Watson leaned forward and pointed down and to the right. "There's the river," he said. "And there's their capital city."

The small spacecraft settled at decreasing speed.

Chessman said, "The central square? It seems to be their market, by the number of people."

"I suppose so," Plekhanov grunted. "Right there before the largest pyramid. We'll remain inside the craft for the rest of today and tonight."

Natt Roberts, who had put away his camera, said, "But why? It's crowded in here."

"Because I said so," Plekhanov rumbled. "This first impression is important. Our flying machine is undoubtedly the first they've seen. We've got to give them time to assimilate the idea and then get together a welcoming committee. We'll want the top men, right from the beginning."

"The equivalent of the Emperor Montezuma meeting Cortez, eh?" Barry Watson said. "A real red carpet welcome."

The *Pedagogue's* space lighter settled to the plaza gently, some fifty yards from the ornately decorated pyramid which stretched up several hundred feet and was topped by a small templelike building.

Chessman stretched and stood up from the controls. "Your anthropology ought to be better than that, Barry," he said. "There was no Emperor Montezuma and no Aztec Empire, except in the minds of the Spanish." He peered out one of the heavy ports. "And by the looks of this town we'll find an almost duplicate of Aztec society. I don't believe they've even got the wheel."

The eight of them clustered about the craft's portholes, taking in the

primitive city that surrounded them. The square had emptied at their approach, and now the several thousand citizens that had filled it were peering fearfully from street entrances and alleyways.

Cogswell, a fiery little technician, said, "Look at them! It'll take hours before they drum up enough courage to come any closer. You were right, doctor. If we left the boat now, we'd make fools of ourselves trying to coax them near enough to talk."

Watson said to Joe Chessman "What do you mean, no Emperor Montezuma?"

Chessman said absently, as he watched, "When the Spanish got to Mexico they didn't understand what they saw, being musclemen rather than scholars. And before competent witnesses came on the scene, Aztec society was destroyed. The conquistadors, who did attempt to describe Tenochtitlán, misinterpreted it. They were from a feudalistic world and tried to portray the Aztecs in such terms. For instance, the large Indian community houses they thought were palaces. Actually, Montezuma was a democratically elected warchief of a confederation of three tribes which militarily dominated most of the Mexican valley. There was no empire because Indian society, being based on the clan, had no method of assimilating newcomers. The Aztec armies could loot and they could capture prisoners for their sacrifices, but they had no system of bringing their conquered enemies into the nation. They hadn't reached that far in the evolution of society. The Incas could have taught them a few lessons."

Plekhanov nodded. "Besides, the Spanish were fabulous liars. In Cortez's attempt to impress Spain's king, he built himself up far beyond reality. To read his reports you'd think the pueblo of Mexico had a population pushing a million. Actually, if it had thirty thousand it was doing well. Without a field agriculture and with their primitive transport, they must have been hard put to feed even that large a town."

A tall, militarily erect native strode from one of the streets that debouched into the plaza and approached to within twenty feet of the space boat. He stared at it for at least ten full minutes then spun on his heel and strode off again in the direction of one of the stolidly built stone buildings that lined the square on each side except that which the pyramid dominated.

Cogswell chirped, "Now that he's broken the ice, in a couple of hours kids will be scratching their names on our hull."

In the morning, two or three hours after dawn, they made their preparations to disembark. Of them all, only Leonid Plekhanov was unarmed. Joe Chessman had a heavy handgun holstered at his waist. The rest of the men carried submachine guns. More destructive weapons were hardly called for, nor available for that matter; once world government had been established on Earth the age-old race for improved arms had fallen away.

Chessman assumed command of the men, growled brief instructions. "If there's any difficulty, remember we're civilizing a planet of nearly a billion population. The life or death of a few individuals is meaningless. Look at our position scientifically, dispassionatey. If it becomes necessary to use force—we have the right and the might to back it up. MacBride, you stay with the ship. Keep the hatch closed and station yourself at the fifty caliber gun."

The natives seemed to know intuitively that the occupants of the craft from the sky would present themselves at this time. Several thousands of them crowded the plaza. Warriors, armed with spears and bronze headed warclubs, kept the more adventurous from crowding too near.

The hatch opened, the steel landing stair snaked out, and the hefty Plekhanov stepped down, closely followed by Chessman. The others brought up the rear, Watson, Roberts, Stevens, Hawkins and Cogswell. They had hardly formed a compact group at the foot of the spacecraft than the ranks of the natives parted and what was obviously a delegation of officials approached them. In the fore was a giant of a man in his late middle years, and at his side a cold visaged duplicate of him, obviously a son.

Behind these were variously dressed others, military, priesthood, local officials, by their appearance.

Ten feet from the newcomers they stopped. The leader said in quite understandable Amer-English, "I am Taller, Khan of all the People. Our legends tell of you. You must be from First Earth." He added with a simple dignity, a quiet gesture, "Welcome to the World. How may we serve you?"

Plekhanov said flatly, "The name of this planet is Texcoco and the inhabitants shall henceforth be called Texcocans. You are correct, we have come from Earth. Our instructions are to civilize you, to bring you the benefits of the latest technology, to prepare you to enter the community of planets." Phlegmatically he let his eyes go to the pyramids, to the temples, the large community dwelling quarters. "We'll call this city Tula and its citizens Tulans."

Taller looked thoughtfully at him, not having missed the tone of arrogant command. One of the group behind the Khan, clad in gray flowing robes, said to Plekhanov, mild reproof in his voice, "My son, we are the most advanced people on . . . Texcoco. We have thought of ourselves as civilized. However, we—"

Plekhanov rumbled, "I am not your son, old man, and you are far short of civilization. We can't stand here forever. Take us to a building where we can talk without these crowds staring at us. There is much to be done."

Taller said, "This is Mynor, Chief Priest of the People."

The priest bowed his head, then said, "The People are used to ceremony on outstanding occasions. We have arranged for suitable sacrifices to the gods. At their completion, we will proclaim a festival. And then—"

The warriors had cleared a way

through the multitude to the pyramid and now the Earthlings could see a score of chained men and women, nude save for loin cloths and obviously captives.

Plekhanov made his way toward them, Joe Chessman at his right and a pace to the rear. The prisoners stood straight and, considering their position, with calm.

Plekhanov glared at Taller. "You were going to kill these?"

The Khan said reasonably, "They are not of the People. They are prisoners taken in battle."

Mynor said, "Their lives please the gods."

"There are no gods, as you probably know," Plekhanov said flatly. "You will no longer sacrifice prisoners."

A hush fell on the Texcocans. Joe Chessman let his hand drop to his weapon. The movement was not lost on Taller's son, whose eyes narrowed.

The Khan looked at the burly Plekhanov for a long moment. He said slowly, "Our institutions fit our needs. What would you have us do with these people? They are our enemies. If we turn them loose, they will fight us again. If we keep them imprisoned, they will eat our food. We . . . Tulans are not poor, we have food aplenty, for we Tulans, but we cannot feed all the thousands of prisoners we take in our wars."

Joe Chessman said dryly, "As of today there is a new policy. We put them to work."

Plekhanov rumbled at him, "I'll explain our position, Chessman, if you please." Then to the Tulans. "To develop this planet we're going to need the labor of every man, woman and child capable of work."

Taller said, "Perhaps your suggestion that we retire to a less public place is desirable. Will you follow?" He spoke a few words to an officer of the warriors, who shouted orders.

The Khan led the way, Plekhanov and Chessman followed side by side and the other Earthlings, their weapons unostentatiously ready, were immediately behind. Mynor the priest, Taller's son and the other Tulan officials brought up the rear.

In what was evidently the reception hall of Taller's official residence, the newcomers were made as comfortable as fur padded low stools provided. Half a dozen teenaged Tulans brought a cool drink similar to coca; it seemed to give a slight lift.

Taller had not become Khan of the most progressive nation on Texcoco by other than his own abilities. He felt his way carefully now. He had no manner of assessing the powers wielded by these strangers from space. He had no intention of precipitating a situation in which he would discover such powers to his sorrow.

He said carefully, "You have indicated that you intend major changes in the lives of the People."

"Of all Texcocans," Plekhanov said, "you Tulans are merely the beginning."

Mynor, the aged priest, leaned forward. "But why? We do not want these changes—whatever they may be.

Already the Khan has allowed you to interfere with our worship of our gods. This will mean—"

Plekhanov growled, "Be silent, old man, and don't bother to mention, ever again, your so-called gods. And now, all of you listen. Perhaps some of this will not be new, how much history has come down to you I don't know.

"A thousand years ago a colony of one hundred persons was left here on Texcoco. It will one day be of scholarly interest to trace them down through the centuries but at present the task does not interest us. This expedition has been sent to recontact you, now that you have populated Texcoco and made such adaptations as were necessary to survive here. Our basic task is to modernize your society, to bring it to an industrialized culture."

Plekhanov's eyes went to Taller's son. "I assume you are a soldier?"

Taller said, "This is Reif, my eldest, and by our custom, second in command of the People's armies. As Khan, I am first."

Reif nodded coldly to Plekhanov. "I am a soldier." He hesitated for a moment, then added, "And willing to die to protect the People."

"Indeed," Plekhanov rumbled, "as a soldier you will be interested to know that our first step will involve the amalgamation of all the nations and tribes of this planet. Not a small task. There should be opportunity for you."

Taller said, "Surely you speak in jest. The People have been at war for as long as scribes have records and never have we been stronger than today, never larger. To conquer the world! Surely you jest."

Plekhanov grunted ungraciously. He looked to Barry Watson, a lanky youth, now leaning negligently against the wall, his submachine gun, however, at the easy ready. "Watson, you're our military expert. Have you any opinions as yet?"

"Yes, sir," Watson said easily. "Until we can get iron weapons and firearms into full production, I suggest the Macedonian phalanx for their infantry. They have the horse, but evidently the wheel has gone out of use. We'll introduce the chariot and also heavy carts to speed up logistics. We'll bring in the stirruped saddle, too. I have available for study, works on every cavalry leader from Tamerlane to Jeb Stuart. Yes, sir, I have some ideas."

Plekhanov pursed his heavy lips. "From the beginnning we're going to need manpower on a scale never dreamed of locally. We'll adopt a policy of expansion. Those who join us freely will become members of the State with full privileges. Those who resist will be made prisoners of war and used for shock labor on the roads and in the mines. However, a man works better if he has a goal, a dream. Each prisoner will be freed and become a member of the State after ten years of such work."

He turned to his subordinates. "Roberts and Hawkins, you will begin tomorrow to seek the nearest practical sources of iron ore and coal.

Wherever you discover them we'll direct our first military expeditions. Chessman and Cogswell, you'll assemble their best artisans and begin their training in such basic advancements as the wheel."

Taller said softly, "You speak of advancement but thus far you have mentioned largely war and on such a scale that I wonder how many of the People will survive. What advancement? We have all we wish."

Plekhanov cut him off with a curt motion of his hand. He indicated the hieroglyphics on the chamber's walls. "How long does it take to learn such writing?"

Mynor, the priest, said, "This is a mystery known only to the priesthood. One spends ten years in preparation to be a scribe."

"We'll teach you a new method which will have every citizen of the State reading and writing within a year."

The Tulans gaped at him.

He moved ponderously over to Roberts, drew from its scabbard the sword bayonet the other had at his hip. He took it and slashed savagely at a stone pillar, gouging a heavy chunk from it. He tossed the weapon to Reif, whose eyes lit up.

"What metals have you been using? Copper, bronze? Probably. Well, that's steel. You're going to move into the iron age overnight."

He turned to Taller. "Are your priests also in charge of the health of your people?" he growled. "Are their cures obtained from mumbo-jumbo and a few herbs found in the desert? Within a decade, I'll guarantee you that not one of your major diseases will remain."

He turned to the priest and said, "Or perhaps this will be the clincher for some of you. How many years do you have, *old man?*"

Mynor said with dignity. "I am sixty-four."

Plekhanov said churlishly, "And I am two hundred and thirty-three." He called to Stevens, "I think you're our youngest. How old are you?"

Stevens grinned, "Hundred and thirteen, next month."

Mynor opened his mouth, closed it again. No man but would prolong his youth. Of a sudden he felt old, old.

Plekhanov turned back to Taller. "Most of the progress we have to offer is beyond your capacity to understand. We'll give you freedom from want. Health. We'll give you advances in every art. We'll eventually free every citizen from drudgery, educate him, give him the opportunity to enjoy intellectual curiosity. We'll open the stars to him. All these things the coming of the State will eventually mean to you."

Tula's Khan was not impressed. "This you tell us, man from First Earth. But to achieve these you plan to change every phase of our lives and we are happy with . . . Tula . . . the way it is. I say this to you. There are but eight of you and many, many of us. We do not want your . . . State. Return from whence you came."

Plekhanov shook his massive head at the other. "Whether or not *you*

want these changes they will be made. If you fail to co-operate, we will find someone who will. I suggest you make the most of it."

Taller arose from the squat stool upon which he'd been seated. "I have listened and I do not like what you have said. I am Khan of all the People. Now leave in peace, or I shall order my warriors . . ."

"Joe," Plekhanov said flatly. "Watson!"

Joe Chessman took his heavy gun from its holster and triggered it twice. The roar of the explosions reverberated thunderously in the confined space, deafening all, and terrifying the Tulans. Bright red colored the robes the Khan wore, colored them without beauty. Bright red splattered the floor.

Leonid Plekhanov stared at his second in command, wet his thick lips. "Joe," he sputtered. "I hadn't . . . I didn't expect you to be so . . . hasty."

Joe Chessman growled, "We've got to let them know where we stand, right now, or they'll never hold still for us. Cover the doors, Watson, Roberts." He motioned to the others with his head. "Cogswell, Hawkins, Stevens, get to those windows and watch."

Taller was a crumbled heap on the floor. The other Texcocans stared at his body in shocked horror.

All expect Reif.

Reif bent down over his father's body for a moment, and then looked up, his lips white, at Plekhanov. "He is dead."

Leonid Plekhanov collected himself. "Yes."

Reif's cold face was expressionless. He looked at Joe Chessman who stood stolidly to one side, gun still in hand.

Reif said, "You can supply such weapons to my armies?"

Plekhanov said, "That is our intention, in time."

Reif came erect. "Subject to the approval of the clan leaders, I am now Khan. Tell me more of this State of which you have spoken."

IV.

The sergeant stopped the small company about a quarter of a mile from the city of Bari. His detachment numbered only ten but they were well armed with short swords and blunderbusses and wore mail and steel helmets. On the face of it, they would have been a match for ten times this number of merchants.

It was hardly noon but the sergeant had obviously already been at his wine flask. He leered at them. "And where do you think you go?"

The merchant who led the rest was a thin little man but he was richly robed and astride a heavy black mare. He said, "To Bari, soldier." He drew a paper from a pouch. "I hold this permission from Baron Mannerheim to pass through his lands with my people and chattels."

The leer turned mercenary. "Unfortunately, city man, I can't read. What do you carry on the mules?"

"Personal property, which, I re-

peat, I have permission to transport over Baron Mannerheim's lands free from harassment from his followers." He added, in irritation, "The baron is a friend of mine, fond of the gifts I give him."

One of the soldiers grunted his skepticism, checked the flint on the lock of his piece, then looked at the sergeant suggestively.

The sergeant said, "As you say, merchant, my lord the baron is fond of gifts. Aren't we all? Unfortunately, I have received no word of your group. My instructions are to stop all intruders upon the baron's lands and, if there is resistance, to slay them and confiscate such properties as they may be carrying."

The merchant sighed and reached into a small pouch. The eyes of the sergeant drooped in greed. The hand emerged with two small coins. "As you say," the merchant muttered bitterly, "we are all fond of gifts. Will you do me the honor to drink my health at the tavern tonight?"

The sergeant said nothing, but his mouth slackened and he fondled the hilt of his sword.

The merchant sighed again and dipped once more into the pouch. This time his hand emerged with half a dozen bits of silver. He handed them down to the other, complaining, "How can a man profit in his affairs if every few miles he must pass another outstretched hand?"

The sergeant growled, "You do not seem to starve, city man. Now, on your way. You are fortunate I am too lazy today to bother going through your things. Besides," and he grinned widely, "the baron gave me personal instructions not to bother you."

The merchant snorted, kicked his heels into his beast's sides and led his half dozen followers toward the city. The soldiers looked after them and howled their amusement. The money was enough to keep them soused for days.

When they were out of earshot, Amschel Mayer grinned his amusement back over his shoulder at Jerome Kennedy. "How'd that come off, Jerry?"

The other sniffed, in mock deprecation. "You're beginning to fit into the local merchant pattern better than the real thing. However, just for the record, I had this, ah, grease gun, trained on them all the time."

Mayer frowned. "Only in extreme emergency, my dear Jerry. The baron would be up in arms if he found a dozen of his men massacred on the outskirts of Bari, and we don't want a showdown at this stage. It's taken nearly a year to build this part we act."

At this time of day the gates of the port city were open and the guards lounged idly. Their captain recognized Amschel Mayer and did no more than nod respectfully.

They wended their way through narrow, cobblestoned streets, avoiding the crowds in the central market area. They pulled up eventually before a house both larger and more ornate than its neighbors. Mayer and Kennedy dismounted from the horses and left their care to the others.

Mayer beat with the heavy knocker on the door and a slot opened for a quick check of his identity. The door opened wide and Technician Martin Gunther let them in.

"The others are here already?" Mayer asked him.

Gunther nodded. "Since breakfast. Baron Leonar, in particular, is impatient."

Mayer said over his shoulder, "All right, Jerry, this is where we put it to them."

They entered the long conference room. A full score of men sat about the heavy wooden table. Most of them were as richly garbed as their host. Most of them in their middle years. All of them alert of eye. All of them confidently at ease.

Amschel Mayer took his place at the table's end and Jerome Kennedy sank into the chair next to him. Mayer took the time to speak to each of his guests individually, then he leaned back and took in the gathering as a whole. He said, "You probably realize that this group consists of the twenty most powerful merchants on the continent."

Olderman nodded. "We have been discussing your purpose in bringing us together, Honorable Mayer. All of us are not friends." He twisted his face in amusement. "In fact, very few of us are friends."

"There is no need for you to be," Mayer said snappishly, "but all are going to realize the need for cooperation. Honorables, I've just come from the city of Ronda. Although I'd paid heavily in advance to the three barons whose lands I crossed, I had to bribe myself through a dozen roadblocks, had to pay exorbitant rates to cross three ferries, and once had to fight off supposed bandits."

One of his guests grumbled, "Who were actually probaby soldiers of the local baron who had decided that although you had paid him transit

fee, it still might be profitable to go through your goods."

Mayer nodded. "Exactly, my dear Honorable, and that is why we've gathered."

Olderman had evidently assumed spokesmanship for the others. Now he said warily, "I don't understand."

"Genoa, if you'll pardon the use of this name to signify the planet upon which we reside, will never advance until trade has been freed from these bandits who call themselves lords and barons."

Eyebrows reached for hairlines.

Olderman's eyes darted about the room, went to the doors. "Please," he said, "the servants."

"My servants are safe," Mayer said.

One of his guests was smiling without humor. "You seem to forget, Honorable Mayer, that I carry the title of baron."

Mayer shook his head. "No, Baron Leonar. But neither do you disagree with what I say. The businesman, the merchant, the manufacturer on Genoa today, is only tolerated. Were it not for the fact that the barons have no desire to eliminate such a profitable source of income, they would milk us dry overnight."

Someone shrugged. "That is the way of things. We are lucky to have wrested, bribed and begged as many favors from the lords as we have. Our twenty cities all have charters that protect us from complete despoilation."

Mayer twisted excitedly in his chair. "As of today, things begin to change. Jerry, that platen press."

Jerry Kennedy left the room momentarily and returned with Martin Gunther and two of the servants. While the assembled merchants looked on, in puzzled silence, Mayer's assistants set up the press and a stand holding two fonts of fourteen point type. Jerry took up a printer's stick and gave running instructions as he demonstrated. Gunther handed around pieces of the type until all had examined it, while his colleague set up several lines. Kennedy transposed the lines to a chase, locked it up and placed the form to one side while he demonstrated inking the small press, which was operated by a foot pedal. He mounted the form in the press, took a score of sheets of paper and rapidly fed them, one by one. When they were all printed, he stopped pumping and Gunther handed the still wet finished product around to the audience.

Olderman stared down at the printed lines, scowled in concentration, wet his lips in sudden comprehension.

But it was merchant Russ who blurted, "This will revolutionize the inscribing of books. Why, it can well take it out of the hands of the Temple! With such a machine I could make a hundred books—"

Mayer was beaming. "Not a hundred, Honorable, but a hundred thousand!"

The others stared at him as though he was demented. "A hundred thousand," one said. "There are not that many literate persons on the continent."

"There will be," Mayer crowed. "This is but one of our levers to pry power from the barons. And here is another." He turned to Russ. "Honorable Russ, your city is noted for the fine quality of its steel, of the swords and armor you produce."

Russ nodded. He was a small man fantastically rich in his attire. "This is true, Honorable Mayer."

Mayer said, tossing a small booklet to the other, "I have here the plans for a new method of making steel from pig iron. The Bessemer method, we'll call it. The principle involved is the oxidation of the impurities in the iron by blowing air through the molten metal."

Amschel Mayer turned to still another. "And your town is particularly noted for its fine textiles." He looked to his assistants. "Jerry, you and Gunther bring in those models of the power loom and the spinning jenny."

While they were gone, he said, "My intention is to assist you to speed up production. With this in mind, you'll appreciate the automatic flying shuttle that we'll now demonstrate."

Kennedy and Gunther re-entered accompanied by four servants and a mass of equipment. Kennedy muttered to Amschel Mayer, "I feel like the instructor of a handicrafts class."

Half an hour later, Kennedy and Gunther wound up passing out pamphlets to the awed merchant guests. Kennedy said, "This booklet will give details on construction of the equipment and its operation."

Mayer pursed his lips. "Your people will be able to assimilate only so fast, so we won't push them. Later, you'll be interested in introducing the mule spinning frame, among other items."

He motioned for the servants to remove the printing press and textile machinery. "We now come to probably the most important of the devices I have to introduce to you today. Because of size and weight, I've had constructed only a model. Jerry!"

Jerry Kennedy brought to the heavy table a small steam engine, clever in its simplicity. He had half a dozen attachments for it. Within moments he had the others around him, as enthusiastic as a group of youngsters with a new toy.

"By the Supreme," Baron Leonar blurted, "do you realize this device could be used instead of waterpower to operate a mill to power the loom demonstrated an hour ago?"

Honorable Russ was rubbing the side of his face thoughtfully. "It might even be adapted to propel a coach. A coach without horses. Unbelievable!"

Mayer chuckled in excitement and clapped his hands. A servant entered with a toy wagon which had been slightly altered. Martin Gunther lifted the small engine, placed it in position atop the wagon, connnected it quickly and threw a lever. The wagon moved smoothly forward, the first engine propelled vehicle of Genoa's industrial revolution.

Martin Gunther smiled widely at Russ. "You mean like this, Honorable?"

Half an hour later they were reseated, before each of them a small pile of phamphlets, instructions, plans, blueprints.

Mayer said, "I have just one more device to bring to your attention at this time. I wish it were unnecessary but I am afraid otherwise."

He held up for their inspection, a forty-five caliber bullet. Jerry Kennedy handed around samples to the merchants. They fingered them in puzzlement.

"Honorables," Mayer said, "the barons have the use of gunpowder. Muskets and muzzleloading cannon are available to them both for their wars against each other and their occasional attacks upon our supposedly independent cities. However, this is an advancement on their weapons. This unit includes not only the bullet's lead, but the powder and the cap which will explode it."

They lacked understanding, and showed it.

Mayer said, "Jerry, if you'll demonstrate."

Jerry Kennedy said, "The bullet can be adapted to various weapons, however, this is one of the simplest." He pressed, one after another, a full twenty rounds into the gun's clip.

"Now, if you'll note the silhouette of a man I've drawn on the wooden frame at the end of the room." He pressed the trigger, sent a single shot into the figure.

Olderman nodded. "An improvement in firearms. But—"

Kennedy said, "However, if you are confronted with more than one of the bad guys." He grinned and flicked the gun to full automatic and in a Götterdämmerung of sound in the confines of the room, emptied the clip into his target sending splinters and chips flying and all but demolishing the wooden backdrop.

His audience sat back in stunned horror at the demonstration.

Mayer said now, "The weapon is simple to construct, any competent gunsmith can do it. It is manifest, Honorables, that with your people so equipped your cities will be safe from attack and so will trading caravans and ships."

Russ said shakily, "Your intention is good, Honorable Mayer, however it will be but a matter of time before the barons have solved the secrets of your weapon. Such cannot be held indefinitely. Then we would again be at their mercy."

"Believe me, Honorable," Mayer said dryly, "by that time I will have new weapons to introduce, if necessary. Weapons that make this one a very toy in comparison."

Olderman resumed his office as spokesman. "This demonstration has astounded us, Honorable Mayer, but although we admire your abilities it need hardly be pointed out that it seems unlikely all this could be the product of one brain."

"They are not mine," Mayer admitted. "They are the products of many minds."

"But where—?"

The Earthman shook his head. "I don't believe I will tell you now."

"I see." The Genoese eyed him

emotionlessly, "Then the question becomes, *why?*"

Mayer said, "It may be difficult for you to see, but the introduction of each of these will be a nail in feudalism's coffin. Each will increase either production or trade and such increase will lead to the overthrow of feudal society."

Baron Leonar, who had remained largely silent throughout the afternoon, now spoke up. "As you said earlier, although I am a lord myself, my interests are your own. I am a merchant first. However, I am not sure I want the changes these devices will bring. Frankly, Honorable Mayer, I am satisfied with my world as I find it today."

Amschel Mayer smiled wryly at him. "I am afraid you *must* adapt to these new developments."

The baron said coldly, "Why? I do not like to be told I must do something."

"Because, my dear baron, there are three continents on the planet of Genoa. At present there is little trade due to inadequate shipping. But the steam engine I introduce today will soon propel larger craft than you have ever built before."

Russ said, "What has this to do with our being forced to use these devices?"

"Because I have colleagues on the other continents busily introducing them. If you don't adapt, in time competitors will invade your markets, capture your trade, drive you out of business."

Mayer wrapped it up. "Honorables, modernize or go under. It's each man for himself and the devil take the hindmost, if you'll allow a saying from another era."

They remained silent for a long period. Finally Olderman stated bluntly, "The barons are not going to like this."

Jerry Kennedy grinned. "Obviously, that's why we've introduced you to the tommy gun. It's not going to make any difference if they like it or not."

Russ said musingly, "Pressure will be put to prevent the introduction of this equipment."

"We'll meet it," Mayer said, shifting happily in his seat.

Russ added, "The Temple is ever on the side of the barons. The monks will fight against innovations that threaten to disturb the present way."

Mayer said, "Monks usually do. How much property is in the hands of the Temple?"

Russ admitted sourly, "The monks are the greatest landlords of all. I would say at least one third of the land and the serfs belong to the Temple."

"Ah," Mayer said. "We must investigate the possibilities of a Reformation. But that can come later. Now I wish to expand on my reason for gathering you.

"Honorables, Genoa is to change rapidly. To survive, you will have to move fast. I have not introduced these revolutionary changes without self-interest. Each of you are free to use them to his profit, however, I expect a thirty per cent interest."

There was a universal gasp.

Olderman said, "Honorable Mayer, you have already demonstrated your devices. What is there to prevent us from playing you false?"

Mayer laughed. "My dear Olderman, I have other inventions to reveal as rapidly as you develop the technicians, the workers, capable of building and operating them. If you cheat me now, you will be passed by next time."

Russ muttered, "Thirty per cent! Your wealth will be unbelievable."

"As fast as it accumulates, Honorables, it shall be invested. For instance, I have great interest in expanding our inadequate universities. The advances I expect will only be possible if we educate the people. Field serfs are not capable of running even that simple steam engine Jerry demonstrated."

Baron Leonar said, "What you contemplate is mind shaking. Do I understand that you wish a confederation of all our cities? A joining together to combat the strength of the present lords?"

Mayer was shaking his head. "No, no. As the barons lose power, each of your cities will strengthen and possibly expand to become nations. Perhaps some will unite. But largely you will compete against each other and against the nations of the other continents. In such competition you'll have to show your mettle, or go under. Man develops at his fastest when pushed by such circumstance."

The Earthling looked off, unseeing, into a far corner of the room. "At least, so is my contention. Far away from here a colleague is trying to prove me wrong. We shall see."

V.

Leonid Plekhanov returned to the *Pedagogue* with a certain ceremony. He was accompanied by Joe Chessman, Natt Roberts and Barry Watson of his original group, but four young, hard-eyed, hard-faced and armed Tulans were also in the party. Their space lighter swooped in, nestled to the *Pedagogue's* hull in the original bed it had occupied on the trip from Terra City, and her port opened to the corridors of the mother ship.

Plekhanov, flanked by Chessman and Watson, strode heavily toward the ship's lounge. Natt Roberts and two of the Tulans remained with the small boat. Two of the other natives followed, their eyes darting here, there, in amazement, in spite of their efforts to appear grim and untouched by it all.

Amschel Mayer was already seated at the officer's dining table. His face displayed his irritation at the other's method of presenting himself. "Good Heavens, Plekhanov, what is this, an invasion?"

The other registered surprise.

Mayer indicated the Texcocans. "Do you think it necessary to bring armed men aboard the *Pedagogue?* Frankly, I have not even revealed to a single Genoese the existence of the ship."

Jerry Kennedy was seated to one side, the only member of Mayer's

team who had accompanied him for this meeting. Kennedy winked at Watson and Chessman. Watson grinned back but held his peace.

Plekhanov sank into a chair, rumbling, "We hold no secrets from the Texcocans. The sooner they advance to where they can use our libraries and laboratories, the better. And the fact these boys are armed has no significance. My Tulans are currently embarked on a campaign to unite the planet. Arms are sometimes necessary, and Tula, my capital, is somewhat of an armed camp. All able-bodied men—"

Mayer broke in heatedly, "And is this the method you use to bring civilization to Texcoco? Is this what you consider the purpose of the Office of Galactic Colonization? An armed camp! How many persons have you slaughtered thus far?"

"Easy," Joe Chessman growled.

Amschel Mayer spun on him. "I need no instruction from you, Chessman. Please remember I'm senior in charge of this expedition and as such rank you."

Plekhanov thudded a heavy hand on the table. "I'll call my assistants to order, Mayer, if I feel it necessary. Admittedly, when this expedition left Terra City you were the ranking officer. Now, however, we've divided—at your suggestion, please remember. Now there are two independent groups and you no longer have jurisdiction over mine."

"Indeed!" Mayer barked. "And suppose I decide to withhold the use of the *Pedagogue's* libraries and laboratories to you? I tell you, Plekhanov—"

Leonid Plekhanov interrupted him coldly. "I would not suggest you attempt any such step, Mayer."

Mayer glared but suddenly reversed himself. "Let's settle down and become more sensible. This is the first conference of the five we have scheduled. Ten years have elapsed. Actually, of course, we've had some idea of each other's progress since team members occasionally meet on trips back here to the *Pedagogue* to consult the library. I am afraid, my dear Leonid, that your theories on industrialization are rapidly being proven inaccurate."

"Nonsense!"

Mayer said smoothly, "In the decade past, my team's efforts have more than tripled the Genoese industrial potential. Last week one of our steamships crossed the second ocean. We've located petroleum and the first wells are going down. We've introduced a dozen crops that had disappeared through misadventure to the original colonists. And, oh yes, our first railroad is scheduled to begin running between Bari and Ronda next spring. There are six new universities and in the next decade I expect fifty more."

"Very good, indeed," Plekhanov grumbled.

"Only a beginning. The breath of competition, of unharnessed enterprise is sweeping Genoa. Feudalism crumbles. Customs, mores and traditions that have held up progress for

a century or more are now on their way out."

Joe Chessman growled, "Some of the boys tell me you've had a few difficulties with this crumbling feudalism thing. In fact, didn't Buchwald barely escape with his life when the barons on your western continent united to suppress all chartered cities?"

Mayer's thin face darkened. "Never fear, my dear Joseph, those barons responsible for shedding the blood of western hemisphere elements of progress will shortly pay for their crimes."

"You've got military problems too, then?" Barry Watson asked.

Mayer's eyes went to him in irritation. "Some of the free cities of Genoa are planning measures to regain their property and rights on the western hemisphere. This has nothing to do with my team, except, of course, in so far as they might sell them supplies or equipment."

The lanky Watson laughed lowly, "You mean like selling them a few quick firing breech loaders and trench mortars?"

Plekhanov muttered, "That'll be enough, Barry."

But Mayer's eyes had widened. "How did you know?" He whirled on Plekhanov. "You're spying on my efforts, trying to negate my work!"

Plekhanov rumbled, "Don't be a fool, Mayer. My team has neither the time nor interest to spy on you."

"Then how did you know—"

Barry Watson said mildly, "I was doing some investigation in the ship's library. I ran into evidence that you people had already used the blueprints for breech loaders and mortars."

Jerry Kennedy came to his feet and rambled over to the messroom's bar. "This seems to be all out spat, rather than a conference to compare progress," he said. "Anybody for a drink? Frankly, that's the next thing I'm going to introduce to Genoa, some halfway decent likker. Do you know what those benighted heathens drink now?"

Watson grinned. "Make mine whisky, Jerry. You've no complaints. Our benighted heathens have a national beverage fermented from a plant similar to cactus. Ought to be drummed out of the human race."

He spoke idly, forgetful of the Tulan guards stationed at the doorway.

Kennedy passed drinks around for everyone save Mayer, who shook his head in distaste. If only for a brief spell, some of the tenseness left the air while the men from Earth sipped their beverages.

Jerry Kennedy said, "Well, you've heard our report. How go things on Texcoco?"

"According to plan," Plekhanov rumbled.

Mayer snorted.

Plekhanov said ungraciously, "Our prime effort is now the uniting of the total population into one strong whole, a super-state capable of accomplishing the goals set us by the Co-ordinator."

Mayer sneered, "Undoubtedly, this goal of yours, this super-state, is being established by force."

"Not always," Joe Chessman said. "Quite a few of the tribes join up on their own. Why not? The State has a lot to offer."

"Such as what?" Kennedy said mildly.

Chessman looked at him in irritation. "Such as advanced medicine, security from famine, military protection from more powerful nations. The opportunity for youth to get an education and find advancement in the State's government—if they've got it on the ball."

"And what happens if they don't *have it on the ball*?"

Chessman growled, "What happens to such under any society? They get the dirty-end-of-the-stick jobs." His eyes went from Kennedy to Mayer. "Are you suggesting you offer anything better?"

Mayer said, "Already on most of Genoa it is a matter of free competition. The person with ability is able to profit from it."

Joe Chessman grunted sour amusement. "Of course, it doesn't help to be the son of a wealthy merchant or a big politician."

Plekhanov took over. "In *any* society the natural leaders come to the top in much the same manner as the big ones come to the top in a bin of potatoes, they just work their way up."

Jerry Kennedy finished his drink and said easily, "At least, those at the top can claim they're the biggest potatoes. Remember back in the twentieth century when Hitler and his gang announced they were the big potatoes in Germany and men of Einstein's stature fled the country—being small potatoes, I suppose."

Amschel Mayer said, "We're getting away from the point. Pray go on, my dear Leonid. You say you are forceably uniting all Texcoco."

"We are uniting all Texcoco," Plekhanov corrected with a scowl. "Not always by force. And that is by no means our only effort. We are ferreting out the most intelligent of the assimilated peoples and educating them as rapidly as possible. We've introduced iron . . ."

"And use it chiefly for weapons," Kennedy murmured.

". . . Antibiotics and other medicines, a field agriculture, are rapidly building roads . . .

"Military roads," Kennedy mused.

". . . To all sections of the State, have made a beginning in naval science, and, of course, haven't ignored the arts."

"On the face of it," Mayor nodded, "hardly approaching Genoa."

Plekhanov rumbled indignantly, "We started two ethnic periods behind you. Even the Tulans were still using bronze, but the Genoese had iron and even gunpowder. Our advance is a bit slow to get moving, Mayer, but when it begins to roll—"

Mayer gave his characteristic snort. "A free people need never worry about being passed by a subjected one."

Barry Watson made himself another drink and while doing so looked over his shoulder at Amschel Mayer. "It's interesting the way you throw about that term *free*. Just what type of government do you sponsor?"

Mayer snapped, "Our team does not interfere in governmental forms, Watson, The various nations are free to adapt to whatever local conditions obtain. They range from some under feudalistic domination to countries with varying degrees of republican democracy. Our base of operations in the southern hemisphere is probably the most advanced of all the chartered cities, Barry. It amounts to a city-state somewhat similar to Florence during the Renaissance."

"And your team finds itself in the position of the Medeci, I imagine."

"You might use that analogy. The Medeci might have been, well, tyrants of Florence, dominating her finances and trade as well as her political government, but they were benevolent tyrants."

"Yeah," Watson grinned. "The thing about a benevolent tyranny, though, is that it's up to the tyrants to decide what's benevolent. I'm not so sure there's a great basic difference between your governing of Genoa and ours of Texcoco."

"Don't be an ass," Mayer snapped. "We are granting the Genoese political freedoms as fast as they can assimilate them."

Joe Chessman growled, "But I imagine it's surprising to find just how slowly they can assimilate. A moment ago you said they were free to form any government they wished. Now you say you feed them what you

call freedom, only so fast as they can assimilate it."

"Obviously we encourage them along whatever path we think will will most quickly develop their economies," Mayer argued. "That's what we've been sent here to do. We stimulate competition, encourage all progress, political as well as economic."

Plekhanov lumbered to his feet. "Amschel, obviously nothing new has been added to our respective positions by this conference. I propose we adjourn to meet again at the end of the second decade."

Mayer said, "I suppose it would be futile to suggest you give up this impossible totalitarian scheme of yours and reunite the expedition."

Plekhanov merely grunted his disgust.

Jerry Kennedy said, "One thing. What stand have you taken on giving your planet immortality?"

"Immortality?" Watson said. "We haven't it to give."

"You know what I mean. It wouldn't take long to extend the life span double or triple the present."

Amschel Mayer said, "At this stage progress is faster with the generations closer together. A man is pressed when he knows he has only twenty or thirty years of peak efficiency. We on Earth are inclined to settle back and take life as it comes; you younger men are all past the century mark, but none have bothered to get married as yet."

"Plenty of time for that," Watson grinned.

"That's what I mean. But a Texcocoan or Genoese feels pressed to wed in his twenties, or earlier, to get his family under way."

"There's another element," Plekhanov muttered. "The more the natives progress the more nearly they'll equal our abilities. I wouldn't want anything to happen to our overall plans. As it is now, their abilities taper off at sixty and they reach senility at seventy or eighty. I think until the end we should keep it this way."

"A cold-blooded view," Kennedy said. "If we extended their life expectancy, their best men would live to be of additional use to planet development."

"But they would not have our dream," Plekhanov rumbled. "Such men might try to subvert us, and, just possibly, might succeed."

"I think Lenoid is right," Mayer admitted with reluctance.

Later, in the space lighter heading back for Genoa, Mayer said speculatively. "Did you notice anything about Leonid Plekhanov?"

Kennedy was piloting. "He seems the same irascible old curmudgeon he's always been."

"It seems to me he's become a touch power mad. Could the pressures he's under cause his mind to slip? Obviously, all isn't peaches and cream in that attempt of his to achieve world government on Texcoco."

"Well," Kennedy muttered, "all isn't peaches and cream with us, either. The barons are far from

licked, especially in the west." He changed the subject. "By the way, that banking deal went through in Pola. I was able to get control."

"Fine," Mayer chuckled. "You must be quite the richest man in the city. There is a certain stimulation in this financial game, Jerry, isn't there?"

"Uh huh," Jerry told him. "Of course, it doesn't hurt to have a marked deck."

"Marked deck?" the other frowned.

"It's handy that gold is the medium of exchange on Genoa," Jerry Kennedy said. "Especially in view of the fact that we have a machine on the ship capable of transmuting metals."

VI.

Leonid Plekhanov, Joseph Chessman, Barry Watson, Khan Reif and several of the Tulan army staff stood on a small knoll overlooking a valley of several square miles. A valley dominated on all sides but the sea by mountain ranges.

Reif and the three Earthlings were bent over a military map depicting the area. Barry Watson traced with his finger.

"There are only two major passes into this valley. We have this one, they dominate that."

Plekhanov was scowling, out of his element and knowing it. "How many men has Mynor been able to get together?"

Watson avoided looking into the older man's face. "Approximately half a million according to Hawkins' estimate. He flew over them this morning."

"Half a million!"

"Including the nomads, of course," Joe Chessman said. "The nomads fight more like a mob than an army."

Plekhanov was shaking his massive head. "Most of them will melt away if we continue to avoid battle. They can't feed that many men on the countryside. The nomads in particular will return home if they don't get a fight soon."

Watson hid his impatience. "That's the point, sir. If we don't break their power now, in a decisive defeat, we'll have them to fight again, later. And already they've got iron swords, the crossbow and even a few muskets. Given time and they'll all be so armed. Then the fat'll be in the fire."

"He's right," Joe Chessman said sourly.

Reif nodded his head. "We must finish them now, if we can. The task will be twice as great next year."

Plekhanov grumbled in irritation. "Half a million of them and something like forty thousand of our Tulans."

Reif corrected him. "Some thirty thousand Tulans, all infantrymen." He added, "And eight thousand allied cavalry only some of whom can be trusted." Reif's ten year old son came up next to him and peered down at the map.

"What's that child doing here?" Plekhanov snapped.

Reif looked into the other's face. "This is Taller Second, my son. You

from First Earth have never bothered to study our customs. One of them is that a Khan's son participates in all battles his father does. It is his training."

Watson was pointing out features on the map again. "It will take three days for their full army to get in here. He added with emphasis, "In retreat, it would take them the same time to get out."

Plekhanov scowled heavily. "We can't risk it. If we were defeated, we have no reserve army. We'd have lost everything." He looked at Joe Chessman and Watson significantly. We'd have to flee back to the *Pedagogue.*"

Reif's face was expressionless.

Barry Watson looked at him. "We won't desert you, Reif, forget about that aspect of it."

Reif said, "I believe you, Barry Watson. You are a . . . soldier."

Dick Hawkins' small biplane zoomed in, landed expertly at the knoll's foot. The occupant vaulted out and approached them at a half run.

Hawkins called as soon as he was within shouting distance. "They're moving in. Their advance cavalry units are already in the pass."

When he was with them, Plekhanov rubbed his hand nervously over heavy lips. He rumbled, "The cavalry, eh? Listen, Hawkins, get back there and dust them. Use the gas."

The pilot said slowly, "I have four bullet holes in my wings."

"Bullet holes!" Joe Chessman snapped.

Hawkins turned to him. "By the looks of things, MacBride's whole unit has gone over to the rebels. Complete with their double barreled muskets. A full thousand of them."

Watson looked frigidly at Leonid Plekhanov. "You insisted on issuing guns to men we weren't sure of."

Plekhanov grumbled, "Confound it, don't use that tone of voice with me. We have to arm our men, don't we?"

Watson said, "Yes, but our still comparatively few advanced weapons shouldn't go into the hands of anybody but trusted citizens of the State, certainly not to a bunch of mercenaries. The only ones we can *really* trust even among the Tulans, are those that were kids when we first took over. The one's we've had time to indoctrinate."

"The mistake's made. It's too late now," Plekhanov said. "Hawkins go back and dust those cavalrymen as they come through the pass."

Reif said, "It was a mistake, too, to allow them the secret of the crossbow."

Plekhanov roared, "I didn't *allow* them anything. Once the crossbow was introduced it was just a matter of time before its method of construction got to the enemy."

"Then it shouldn't have been introduced," Reif said, his eyes unflinching from the Earthman's.

Plekhanov ignored him. He said, "Hawkins, get going on that dusting. Watson, pull what units we already have in this valley back through the pass we control. We'll avoid battle until more of their army has fallen away."

Hawkins said with deceptive mildness, "I just told you those cavalrymen have muskets. To fly low enough to use gas on them, I'd get within easy range. Point one, this is the only aircraft we've built. Point two, MacBride is probably dead, killed when those cavalrymen mutinied. Point three, I came on this expedition to help modernize the Texcocans, not to die in battle."

Plekhanov snarled at him. "Coward, eh?" He turned churlishly to Watson and Reif. "Start pulling back our units."

Barry Watson looked at Chessman. "Joe?"

Joe Chessman shook his head slowly. He said to Reif, "Khan, start bringing your infantry through the pass. Barry, we'll follow your plan of battle. We'll anchor one flank on the sea and concentrate what cavalry we can trust on the hills on the right. That's the bad spot, that right flank has to hold."

Plekhanov's thick lips trembled. He said in fury, "Is this insubordination?"

Reif turned on his heel and followed by young Taller and his staff hurried down the knoll to where their horses were tethered.

Chessman said to Hawkins, "If you've got the fuel, Dick, maybe it'd be a good idea to keep them under observation. Fly high enough, of course, to avoid gunfire."

Hawkins darted a look at Plekhanov, turned and hurried back to his plane.

Joe Chessman, his voice sullen, said to Plekhanov, "We can't afford any more mistakes, Leonid. We've had too many already." He said to Watson, "Be sure and let their cavalry units scout us out. Allow them to see that we're entering the valley too. They'll think they've got us trapped."

"They will have!" Plekhanov roared. "I countermand that order, Watson! We're withdrawing."

Barry Watson raised his eyebrows at Joe Chessman.

"Put him under arrest," Joe growled sourly. "We'll decide what to do about it later."

By the third day, Mynor's rebel and nomad army had filed through the pass and was forming itself into battle array. Rank upon rank upon rank.

The Tulan infantry had taken less than half a day to enter. They had camped and rested during the interval, the only action being on the part of the rival cavalry forces.

Now the thirty thousand Tulans went into their phalanx and began their march across the valley.

Joe Chessman, Hawkins, Roberts, Stevens and Khan Reif and several of his men again occupied the knoll which commanded a full view of the terrain. With binoculars and wrist radios from the *Pedagogue* they kept in contact with the battle.

Below, Barry Watson walked behind the advancing infantry. There were six divisions of five thousand men each, twenty-four foot *sarissas* stretched before their sixteen man

deep line. Only the first few lines were able to extend their weapons; the rest gave weight and supplied replacements for the advanced lines' casualties. Behind them all the Tulan drums beat out the slow, inexorable march.

Cogswell, beside Watson with the wrist radio, said excitedly, "Here comes a cavalry charge, Barry. Reif says right behind it the nomad infantry is coming in." Cogswell cleared his throat. "All of them."

Watson held up a hand in signal to his officers. The phalanx ground to a halt, received the charge on the hedge of *sarissas*. The enemy cavalry wheeled and attempted to retreat to the flanks but were caught in a bloody confusion by the pressure of their own advancing infantry.

Cogswell, his ear to the radio, said, "Their main body of horse is hitting our right flank." He wet his lips. "We're outnumbered there something like ten to one. At least ten to one."

"They've got to hold," Watson said. "Tell Reif and Chessman that flank has to hold."

The enemy infantrymen in their hundreds of thousands hit the Tulan line in a clash of deafening military thunder. Barry Watson resumed his pacing. He signaled to the drummers who beat out another march. The phalanx moved forward slowly, and slowly went into an echelon formation, each division slightly ahead of the one following. Of necessity, the straight lines of the nomad and rebel front had to break.

The drums went *boom*, ah, *boom*, ah, *boom*, ah, *boom*.

The Tulan phalanx moved slowly, obliquely across the valley. The hedge of spears ruthlessly pressed the mass of enemy infantry before them.

The sergeants paced behind, shouting over the din. "Dress it up. You there, you've been hit, fall out to the rear."

"I'm all right," the wounded spearman snarled, battle lust in his voice.

"Fall out, I said," the sergeant roared. "You there, take his place."

The Tulan phalanx ground ahead.

One of the sergeants grinned wanly at Barry Watson as his men moved forward with the preciseness of the famed Rockettes of another era. "It's working," he said proudly.

Barry Watson snorted, "Don't give me credit. It belongs to a man named Philip of Macedon, a long ways away in both space and time."

Cogswell called, "Our right flank cavalry is falling back. Joe wants to know if you can send any support."

Watson's face went expressionless. "No," he said flatly. "It's got to hold. Tell Joe and the Khan it's got to hold. Suggest they throw in those cavalry units they're not sure of. The ones that threatened mutiny last week."

Joe Chessman stood on the knoll flanked by the Khan's ranking officers and the balance of the Earthmen. Natt Roberts was on the radio. He turned to the others and worriedly repeated the message.

Joe Chessman looked out over the valley. The thirty thousand man phalanx was pressing back the enemy

infantry with the precision of a machine. He looked up the hillside at the point where the enemy cavalry was turning the right flank. Given cavalry behind the Tulan line and the battle was lost.

"O.K., boys," Chessman growled sourly, "we're in the clutch now. Hawkins!"

"Yeah," the pilot said.

"See what you can do. Use what bombs you have including the napalm. Fly as low as you can in the way of scaring their horses." He added sourly, "Avoiding scaring ours, if you can."

"You're the boss," Hawkins said, and scurried off toward his scout plane.

Joe Chessman growled to the others, "When I was taking my degree in primitive society and primitive military tactics, I didn't exactly have this in mind. Come on!"

It was the right thing to say. The other Earthmen laughed and took up their equipment, submachine guns, riots guns, a flame thrower, grenades, and followed him up the hill toward the fray.

Chessman said over his shoulder to Reif. "Khan, you're in the saddle. You can keep in touch with both Watson and us on the radio."

Reif hesitated only a moment. "There is no need for further direction of the battle from this point. A warrior is of more value now than a Khan. Come my son." He caught up a double barreled musket and followed the Earthmen. The ten years old Taller scurried after with a revolver.

Natt Roberts said, "If we can hold their cavalry for only another half hour, Watson's phalanx will have their infantry pressed up against the pass they entered by. It took them three days to get through it, they're not going to be able to get out in hours."

"That's the idea," Joe Chessman said dourly, "Let's go."

VII.

Amschel Mayer was incensed.

"What's got into Buchwald and MacDonald?" he spat.

Jerry Kennedy, attired as was his superior in fur trimmed Genoese robes, signaled one of the servants for a refilling of his glass and shrugged.

"I suppose it's partly our own fault," he said lightly. He sipped the wine, made a mental note to buy up the rest of this vintage for his cellars before young Mannerheim or someone else did so.

"Our fault!" Mayer glared.

The old boy was getting decreasingly tolerant as the years went by, Kennedy decided. He said soothingly, "You sent Peter and Fred over there to speed up local development. Well, that's what they're doing."

"Are you insane!" Mayer squirmed in his chair. "Did you read this radiogram? They've squeezed out all my holdings in rubber, the fastest growing industry on the western continent. Why, millions are involved. Who do they think they are?"

Kennedy put down his glass and chuckled. "See here, Amschel, we're developing this planet by encouraging free competition. Our contention is that under such a socio-economic system the best men are brought to the lead and benefit all society by the advances they make."

"So! What has this got to do with MacDonald and Buchwald betraying my interests?"

"Don't you see? Using your own theory, you have been set back by someone more efficiently competitive. Fred and Peter saw an opening and, in keeping with your instructions, moved in. It's just coincidence that the rubber they took over was your property rather than some Genoese operator's. If you were open to a loss there, then if they hadn't taken over someone else could have. Possibly Baron Leonar or even Russ."

"That reminds me," Mayer snapped, "our Honorable Russ is getting too big for his britches in petroleum. Did you know he's established a laboratory in Amerus? Has a hundred or more chemists working on new products."

"Fine," Kennedy said.

"Fine! What do you mean? Dean is our man in petroleum."

"Look here, if Russ can develop the industry even faster than Mike Dean, let him go ahead. That's all to our advantage."

Mayer leaned forward and tapped his assistant emphatically on the knee. "Look here, yourself, Jerry Kennedy. At this stage we don't want things getting out of our hands. A culture is in the hands of those who control the wealth; the means of production, distribution, communication. Theirs is the real power. I've made a point of spacing our men about the whole planet. Each specializes, though not exclusively. Gunther is our mining man, Dean heads petroleum, MacDonald shipping, Buchwald textiles, Rykov steel, and so forth. As fast as this planet can assimilate we push new inventions, new techniques, often whole new sciences, into use. Meanwhile, you and I sit back and dominate it all through that strongest of power mediums, finance."

Jerry Kennedy nodded. "I wouldn't worry about old man Russ taking over Dean's domination of oil, though. Mike's got the support of all the *Pedagogue's* resources behind him. Besides, we've got to let these Genoese get into the act. The more the economy expands, the more capable men we need. As it is, I think we're already spread a little too thin."

Amschel Mayer had dropped the subject. He was reading the radiogram again and scowling his anger. "Well, this cooks MacDonald and Buchwald. I'll break them."

His assistant raised his eyebrows. "How do you mean?"

"I'm not going to put up with my subordinates going against my interests."

"In this case, what can you do about it? Business is business."

"You hold quite a bit of their paper, don't you?"

"You know that. Most of our

team's finances funnel through my hands."

"We'll close them out. They've become too obsessed with their wealth. They've forgotten why the *Pedagogue* was sent here. I'll break them, Jerry. They'll come crawling. Perhaps I'll send them back to the *Pedagogue.* Make them stay aboard as crew."

Kennedy shrugged. "Well, Peter MacDonald's going to hate that. He's developed into quite a high liver—gourmet food, women, one of the swankiest estates on the eastern continent."

"Ha!" Mayer snorted. "Let him go back to ship's rations and crew's quarters."

A servant entered the lushly furnished room and announced, "Honorable Gunther calling on the Honorables Mayer and Kennedy."

Martin Gunther hurried into the room, for once his calm ruffled. "On the western continent," he blurted. "Dean and Rosetti. The Temple got them, they've been burned as witches."

Amschel Mayer shot to his feet. "That's the end," he swore shrilly. "Only in the west have the barons held out. I thought we'd slowly wear them down, take over their powers bit by bit. But this does it. This means we fight."

He spun to Kennedy. "Jerry, make a trip out to the *Pedagogue.* You know the extent of Genoa's industrial progress. Seek out the most advanced weapons this technology could produce."

Kennedy came to his own feet, shocked by Gunther's news. "But, Amschel, do you think it's wise to precipitate an intercontinental war? Remember, we've been helping to industrialize the west, too. It's almost as adavnced as our continent. Their war potential isn't negligible."

"Nevertheless," Mayer snapped, "we've got to break the backs of the barons and the Temple monks. Get messages off to Baron Leonar and young Mannerheim, to Russ and Olderman. We'll want them to put pressure on their local politicians. What we need is a continental alliance for this war."

Gunther said, "Should I get in touch with Rykov? He's still over there."

Mayer hesitated. "No," he said. "We'll keep Nick informed but he ought to remain where he is. We'll still want our men in the basic positions of power after we've won."

"He might get hurt," Gunther scowled. "They might get him too, and we've only got six team members left now."

"Nonsense, Nick Rykov can take care of himself."

Jerry Kennedy was upset. "Are you sure about this war, chief? Isn't a conflict of this size apt to hold up our overall plans?"

"Of course not," Mayer scoffed. "Man makes his greatest progress under pressure. A major war will unite the nations of both the western continent and this one as nothing else could. Both will push their development to the utmost."

He added thoughtfully, "Which

reminds me. It might be a good idea for us to begin accumulating interests in such industries as will be effected by a war economy."

Jerry Kennedy chuckled at him, "Merchant of death."

"What?"

"Nothing," Kennedy said. "Something I read about in a history book."

VIII.

At the decade's end, once again the representatives of the Genoese team were first in the *Pedagogue's* lounge. Mayer sat at the officer's table, Martin Gunther at his right. Jerry Kennedy leaned against the ship's bar, sipping appreciatively at a highball.

They could hear the impact of the spaceboat from Texcoco when it slid into its bed.

"Poor piloting," Gunther mused. "Whoever's doing that flying doesn't get enough practice."

They could hear ports opening and then the sound of approaching feet. The footsteps had a strangely military ring.

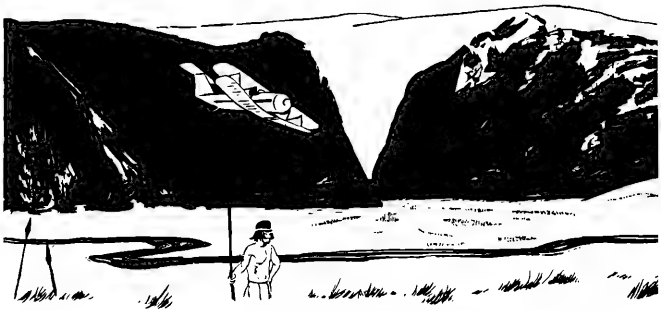
Joe Chessman entered, followed immediately by Barry Watson, Dick Hawkins and Natt Roberts. They were all dressed in heavy uniform, complete with decorations. Behind them were four Texcocoans, including Reif and his teen-age son Taller.

Mayer scowled at them in way of greeting. "Where's Plekhanov?"

"Leonid Plekhanov is no longer with us," Chessman said dourly. "Under pressure his mind evidently snapped and he made decisions that would have meant the collapse of the expedition. He resisted when we reasoned with him."

The four members of the Genoese team stared without speaking. Jerry Kennedy put down his glass at last. "You mean you had to restrict him? Why didn't you bring him back to the ship!"

Chessman took a chair at the table. The others assumed standing positions behind him. "I'm afraid we'll



have to reject your views on the subject. Twenty years ago this expedition split into two groups. My team will accomplish its tasks, your opinions are not needed."

Amschel Mayer glared at the others in hostility. "You have certainly come in force this time."

Chessman said flatly, "This is all of us, Mayer."

"All of you! Where are Stevens, Cogswell, MacBride?"

Barry Watson said, "Plekhanov's fault. Lost in the battle that broke the back of the rebels. At least Cogswell and MacBride were. Stevens made the mistake of backing Plekhanov when the showdown came."

Joe Chessman looked sourly at his military chief. "I'll act as team spokesman, Barry."

"Yes, sir," Watson said.

"Broke the back of the rebels," Jerry Kennedy mused. "That opens all sorts of avenues, doesn't it?"

Chessman growled. "I suppose that in the past twenty years your team had no obstacles. Not a drop of blood shed. Come on, the truth. How many of your team has been lost?"

Mayer shifted in his chair. "Possibly your point is well taken. Dean and Rosetti were burned by the formerly dominant religious group. Rykov was killed in a fracas with bandits while he was transporting some gold." He added, musingly, "We lost more than half a million Genoese pounds in that robbery."

"Only three men lost, eh?"

Mayer stirred uncomfortably, then flushed in irritation at the other's tone. "Something has happened to Buchwald and MacDonald. They must be insane. They've broken off contact with me, are amassing personal fortunes in the eastern hemisphere."

Hawkins laughed abruptly. "Free competition," he said.

Chessman growled, "Let's halt this bickering and get to business. First let me introduce Reif, Texcocoan

State Army Chief of Staff and his son Taller. And these other Texcocans are Wiss and Foken, both of whom have gone far in the sciences."

The Tulans shook hands, Earth style, but then stepped to the rear again where they followed the conversation without comment.

Mayer said, "You think it wise to introduce natives to the *Pedagogue?*"

"Of course," Chessman said. "Following this conference, I'm going to take Fokin and Wiss into the library. What're we here for if not to bring these people up to our level as rapidly as possible?"

"Very well," Mayer conceded grudgingly. "And now I have a complaint. When the *Pedagogue* first arrived we had only so many weapons aboard. You have appropriated more than half in the past two decades."

Chessman shrugged it off. "We'll return the greater part to the ship's arsenal. At this stage we are producing our own."

"I'll bet," Kennedy said. "Look, any of you fellows want a real Earthside whisky? When we were crewing this expedition, why didn't we bring someone with a knowledge of distilling, brewing and such?"

Mayer snapped at him, "Jerry, you drink too much."

"The hell I do," the other said cheerfully. "Not near enough."

Barry Watson said easily, "A drink wouldn't hurt. Why're we so stiff? This is the first gettogether for ten years. Jerry, you're putting on weight."

Kennedy looked down at his admittedly rounded stomach. "Don't get enough exercise," he said, then reversed the attack. "You look older. Are your taking your rejuvenation treatments?"

Barry Watson grimaced. "Sure, but I'm working under pressure. It's been one long campaign."

Kennedy passed around the drinks.

Dick Hawkins laughed. "It's been one long campaign, all right. Barry has a house as big as a castle and six or eight women in his harem."

Watson flushed, but obviously without displeasure.

Martin Gunther, of the Genoese team, cocked his head. "Harem?"

Joe Chessman said impatiently, "Man adapts to circumstances, Gunther. The wars have lost us a lot of men. Women are consequently in a surplus. If the population curve is to continue upward, it's necessary that a man serve more than one woman. Polygamy is the obvious answer."

Gunther cleared his throat smoothly, "So a man in Barry's position will have as many as eight wives eh? You must have lost a *good many* men."

Watson grinned modestly. "Everybody doesn't have that many. It's according to your ability to support them, and, also, rank has its privileges. Besides, we figure it's a good idea to spread the best seed around. By mixing our blood with the Texcocan we improve the breed."

Behind him, Taller, the Tulan boy, stirred, without notice.

Kennedy finished off his highball and began to build another imme-

diately. "Here we go again. The big potatoes coming to the top."

Watson flushed. "What do you mean by that, Kennedy?"

"Oh, come off it, Barry," Kennedy laughed. "Just because you're in a position to push these people around doesn't make you the prize stud on Texcoco."

Watson elbowed Dick Hawkins to one side in his attempt to get around the table at the other.

Chessman rapped, "Watson! That's enough. Knock it off or I'll have you under arrest." The Texcocan team head turned abruptly to Mayer and Kennedy. "Let's stop this nonsense. We've come to compare progress. Let's begin."

The three members of the Genoese team glared back in antagonism, but then Gunther said grudgingly, "He's right. There is no longer amiability between us, so lets forget about it. Perhaps when the fifty years is up, things will be different. Now let's merely be businesslike."

"Well," Mayer said, "our report is that progress accelerates. Our industrial potential expands at a rate that surprises even us. In the near future we'll introduce the internal combustion engine. Our universities still multiply and are turning out technicians, engineers, scientists at an ever quickening speed. In several nations illiteracy is practically unknown and per capita production increases almost everywhere." Mayer paused in satisfaction, as though awaiting the others to attempt to top his report.

Joe Chessman said sourly, "Ah, almost everywhere per capita production increases. Why *almost?*"

Mayer snapped, "Obviously, in a system of free competition, all cannot progress at once. Some go under."

"Whole nations?"

"Temporarily whole nations can receive setbacks as a result of defeat in war, or perhaps due to lack of natural resources. Some nations progress faster than others."

Chessman said, "The whole Texcocan State is one great unit. Everywhere the gross product increases. Within the foreseeable future the standard of living will be excellent."

Jerry Kennedy, an alcoholic lisp in his voice now, said, "You mean you've accomplished a planet-wide government?"

"Well, no. Not as yet," Chessman's sullen voice had an element of chagrin in it. "However, there are no strong elements left that oppose us. We are now pacifying the more remote areas."

"Sounds like a rather bloody program—especially if Barry Watson, here, winds up with eight women," Martin Gunther said.

Watson started to say something but Chessman held up a restraining hand. "The Texcocan State is too strong to be resisted, Gunther. It is mostly a matter of getting around to the more remote peoples. As soon as we bring in a new tribe, we convert it into a commune."

"Commune!" Kennedy blurted.

Joe Chessman raised his thick eye-

brows at the other. "The most efficient socio-economic unit at this stage of development. Tribal society is perfectly adapted to fit into such a plan. The principal difference between a tribe and a commune is that under the commune you have the advantage of a State above in a position to give you the benefit of mass industries, schools, medical assistance. In return, of course, for a certain amount of taxes, military levies and so forth."

Martin Gunther said softly, "I recall reading of the commune system as a student, but I fail to remember the supposed advantages."

Chessman growled, "They're obvious. You have a unit of tens of thousands of persons. Instead of living in individual houses, each with a man working while the woman cooks and takes care of the home, all live in community houses and take their meals in messhalls. The children are cared for by trained nurses. During the season all physically capable adults go out en masse to work the fields. When the harvest has been taken in, the farmer does not hole up for the winter but is occupied in local industrial projects, or in road or dam building. The commune's labor is never idle."

Kennedy shuddered involuntarily.

Chessman looked at him coldly. "It means quick progress. Meanwhile, we go through each commune and from earliest youth, locate those members who are suited to higher studies. We bring them into State schools where they get as much education as they can assimilate—more than is available in commune schools. These are the Texcocans we are training in the sciences."

"The march to the anthill," Amschel Mayer muttered.

Chessman eyed him scornfully. "You amuse me, old man. You with your talk of building an economy with a system of free competition. Our Texcocans are sacrificing today but their children will live in abundance. Even today, no one starves, no one goes without shelter nor medical care." Chessman twisted his mouth wryly. "We have found that hungry, cold or sick people cannot work efficiently."

He stared challengingly at the Genoese leader. "Can you honestly say that there are no starving people in Genoa? No inadequately housed, no sick without hope of adequate medicine? Do you have economic setbacks in which poorly planned production goes amuck and depressions follow with mass unemployment?"

"Nevertheless," Mayer said with unwonted calm, "our society is still far ahead of yours. A mere handful of your bureaucracy and military chiefs enjoy the good things of life. There are tens of thousands on Genoa who have them. Free competition has its weaknesses, perhaps, but it provides a greater good for a greater number of persons."

Joe Chessman came to his feet. "We'll see," he said stolidly. "In ten years, Mayer, we'll consider the position of both planets once again."

"Ten years it is," Mayer snapped back at him.

Jerry Kennedy saluted with his glass. "Cheers," he said.

On the return to Genoa Amschel Mayer said to Kennedy, "Are you sober enough to assimilate something serious?"

"Sure, chief, of course."

"Hm-m-m. Well then, begin taking the steps necessary for us to place a few men on Texcoco in the way of, ah intelligence agents."

"You mean some of our team?" Kennedy said, startled.

"No, of course not. We can't spare them, and, besides, there'd be too big a chance of recognition and exposure. Some of our more trusted Genoese. Make the monetary reward enough to attract their services." He looked at his lieutenants significantly. "I think you'll agree that it might not be a bad idea to keep our eyes on the developments on Texcoco."

On the way back to Texcoco, Barry Watson said to his chief, "What do you think of putting some security men on Genoa, just to keep tabs?"

"Why?"

Watson looked at his fingers, nibbled at a hangnail. "It just seems to me it wouldn't hurt any."

Chessman snorted.

Dick Hawkins said, "I think Barry's right. They can bear watching. Besides in another decade or so they'll realize we're going to beat them. Mayer's ego isn't going to take that. He'd go to just about any extreme to keep from losing face back on Earth."

Natt Roberts said worriedly, "I think they're right, Joe. Certainly it wouldn't hurt to have a few Security men over there. My department could train them and we'd ferry them over in this space boat."

"I'll make the decisions," Chessman growled at them. "I'll think about this. It's just possible that you're right though."

Behind them, Reif looked thoughtfully at his teen-age son.

IX.

Down the long palace corridor strode Barry Watson, Dick Hawkins, Natt Roberts, the aging Reif and his son Taller, now in the prime of manhood. Their faces were equally wan from long hours without sleep. Half a dozen Tulan infantrymen brought up their rear.

As they passed Security Police guards, to left and right, eyes took in their weapons, openly carried. But such eyes shifted and the guards remained at their posts. Only one sergeant opened his mouth in protest. "Sir," he said to Watson, hesitantly, "you are entering Number One's presence armed."

"Shut up," Natt Roberts rapped at him.

Reif said, "That will be all, sergeant."

The Security Police sergeant looked emptily after them as they progressed down the corridor.

Together, Watson and Reif motioned aside the two Tulan soldiers

who stood before the door of their destination, and pushed inward without knocking.

Joe Chessman looked up wearily from his map and dispatch laden desk. For a moment his hand went to the heavy military revolver at his right but when he realized the identity of his callers, it fell away.

"What's up now?" he said, his voice on the verge of cracking.

Watson acted as spokesman. "It's everywhere the same. The communes are on the fine edge of revolt. They've been pushed too far, they've got to the point where they just don't give a damn. A spark and all Texcoco goes up in flames."

Reif said coldly, "We need immediate reforms. They've got to be pacified. An immediate announcement of more consumer goods, fewer State taxes, above all a relaxation of Security Police pressures. Given immediate promise of these, we might maintain ourselves."

Joe Chessman's sullen face was twitching at the right corner of his mouth. Young Taller made no attempt to disguise his contempt at the other's weakness in time of stress.

Chessman's eyes went around the half circle of them. "This is the only alternative? It'll slow up our heavy industry program. We might not catch up with Genoa as quickly as planned."

Watson gestured with a hand in quick irritation. "Look here, Chessman, don't we get through to you? Whether or not we build up a steel capacity as large as Amschel Mayer's isn't important now. Everything's at stake."

"Don't talk to me that way, Barry," Chessman growled truculently. "I'll make the decisions. I'll do the thinking." He said to Reif, "How much of the Tulan army is loyal?"

The aging Tulan looked at Watson before turning back to Joe Chessman. "All of the Tulan army is loyal —to me."

"Good!" Chessman pushed some of the dispatches on his desk aside, letting them flutter to the floor. He bared a field map. "If we crush half a dozen of the local communes . . . crush them hard! Then the others . . ."

Watson said very slowly and so low as hardly to be heard, "You didn't bother to listen, Chessman. We told you, all that's needed is a spark."

Joe Chessman sat back in his chair, looked at them all again, one by one. Re-evaluating. For a moment the facial tic stopped and his eyes held the old alertness.

"I see," he said. "And you all recommend capitulation to their demands?"

"It's our only chance," Hawkins said. "We don't even know it'll work. There's always the chance if we throw them a few crumbs they'll want the whole loaf. You've got to remember that some of them have been living for twenty-five years or more under this pressure. The valve is about to blow."

"I see," Chessman grunted. "And what else? I can see in your faces there's something else."

The three Earthmen didn't answer. Their eyes shifted.

He looked to young Taller and then to Reif. "What else?"

"We need a scapegoat," Reif said without expression.

Joe Chessman thought about that. He looked to Barry Watson again.

Watson said, 'The whole Texcocan State is about to topple. Not only do we have to give them immediate reform, but we're going to have to blame the past hardships and mistakes on somebody. Somebody has to take the rap, be thrown to the wolves. If not, maybe we'll all wind up taking the blame."

"Ah," Chessman said. His red rimmed eyes went around them again, thoughtfully. "We should be able to dig up a few local chieftains and some of the Security Police heads."

They shook their heads. "It has to be somebody big," Natt Roberts said thickly, "a few of my Security Police won't do it."

Joe Chessman's eyes went to Reif. "The Khan is the highest ranking Texcocan of all," he said, finally. "The Khan and some Security Police heads would satisfy them."

Reif's face was as frigid as the Earthman's. He said, "I am afraid not, Joseph Chessman. You are Number One. It is your statue that is in every commune square. It is your portrait that hangs in every distribution center, every messhall, every schoolroom. You are the Number One—as you have so often pointed out to us. My title has become meaningless."

Joe Chessman spat out a curse, fumbled the gun into his hand and fired before the Tulan soldiers could get to him. In a moment they had wrested the weapon from his hand and had his arms pinioned. It was too late.

Reif had been thrown backward two paces by the blast of the heavy calibered gun. Now he held a palm over his belly and staggered to a chair. He collapsed into it, looked at his son, let a wash of amusement pass over his face, said, "Khan," meaninglessly, and died.

Natt Roberts shrilled at Chessman, "You fool, we were going to give you a big, theatrical trial. Sentence you to prison and then, later, claim you'd died in your cell and smuggle you out to the *Pedagogue.*"

Watson snapped to the guards, "Take him outside and shoot him."

The Tulans began dragging the snarling, cursing Chessman to the door.

Taller said, "A moment, please."

Watson, Roberts and Hawkins looked to him.

Taller said, "This perhaps can be done more effectively."

His voice was completely emotionless. "This man has killed both my father and grandfather, both of them Khans of Tula, heads of the most powerful city on all Texcoco, before the coming of you Earthlings."

The guards hesitated. Watson detained them with a motion of his hand.

Taller said, "I suggest you turn him over to me, to be dealt with in the traditional way of the People."

"No," Chessman said hoarsely. "Barry, Dick, Natt, send me back to the *Pedagogue*. I'll be out of things there. Or maybe Mayer can use me on Genoa."

They didn't bother to look in his direction. Roberts muttered savagely, "We told you all that was needed was a spark. Now you've killed the Khan, the most popular man on Texcoco. There's no way of saving you."

Taller said, "None of you have studied our traditions, our customs. But now, perhaps, you will understand the added effect of my taking charge. It will be a more . . .profitable manner of using the downfall of this . . . this power mad murderer."

Chessman said desperately, "Look, Barry, Natt, if you have to, shoot me. At least give me a man's death. Remember those human sacrifices the Tulans had when we first arrived? Can you imagine what went on in those temples? Barry, Dick—for old time's sake, boys . . ."

Barry Watson said to Taller, "He's yours. If this doesn't take the pressure off us, nothing will."

X.

At the end of the third decade, the Texcocan delegation was already seated in the *Pedagogue's* lounge when Jerome Kennedy, Martin Gunther, Peter MacDonald, Fredric Buchwald and three Genoese, Baron Leonar and the Honorables Russ and Modrin appeared.

The Texcocan group consisted of Barry Watson, Dick Hawkins and Natt Roberts to one side of him, Generalissimo Taller and six highly bemedaled Texcocans on the other.

Before taking a seat Barry Watson barked, "Where's Amschel Mayer? I've got some important points to cover with him."

"Take it easy," Kennedy slurred. "For that matter, where's Joe Chessman?"

Watson glared at the other. "You know where he is."

"That I do," Kennedy said. "He's purged, to use a term of yesteryear. At the rate you laddy-bucks are going, there won't be anything left of you by the time our half century is up." He snapped his fingers and a Genoese servant who'd been inconspicuously in the background, hurried to his side. "Let's have some refreshments here. What'll everybody have?"

"You act as though you've had enough already," Watson bit out.

Kennedy ignored him, insisted on everyone being served before he allowed the conversation to turn serious. Then he said, slyly, "I see we've been successful in apprehending all of your agents, or you'd know more of our affairs."

"Not all our agents," Watson barked. "Only those on your southern continent. What happened to Amschel Mayer?"

Peter MacDonald, who, with Buchwald, was for the first time attending one of the decade-end conferences, had been hardly recognized in his new girth by the Texcocan team. But

his added weight had evidently done nothing to his keenness of mind. He said smoothly, "Our good Amschel is under arrest. Imprisoned, in fact." He shook his head, his double chin wobbling. "A tragedy."

"Imprisoned! By whom?" Taller scowled. "I don't like this. After all, he was your expedition's head man."

Barry Watson rapped, "Don't leave us there, MacDonald. What happened to him?"

MacDonald explained. "The financial and industrial empire he had built was overextended. A small crisis and it collapsed. Thousands of investors suffered. In brief, he was arrested and found guilty."

Watson was unbelieving. "There is nothing you could do? The whole team! Couldn't you bribe him out? Rescue him by force and get him back to the ship? With all the wealth you characters control—"

Jerry Kennedy laughed shortly. "We were busy bailing ourselves out of our own situations, Watson. You don't know what international finance can be. Besides, he dug his grave . . . uh . . . that is, he made his bed."

Kennedy signaled the servant for another drink, said, "Let's cut out this dismal talk. How about our progress reports?"

"Progress reports," Barry Watson said. "That's a laugh. You have agents on Texcoco, we have them on Genoa. What's the use of having these conferences at all?"

For the first time, one of the Genoese put in a word. Baron Leonar, son of the original Baron who had met with Amschel Mayer thirty years before, was a man in his mid-forties. He said quietly. "It seems to me the time has arrived when the two planets might profit by intercourse. Surely in this time one has progressed beyond the other in this field, but lagged in that. If I understand the mission of the *Pedagogue* it is to bring us to as high a technological level as possible in half a century. Already three decades have passed."

The Texcocans studied him thoughtfully, but Jerry Kennedy waved in negation with the hand that held his glass. "You don't get it, Baron. You see, the thing is we wanta find out what system is going to do the most the quickest. If we co-operate with Barry's gang, everything'll get all mixed up."

The Honorable Russ, now a wizened man of at least seventy, but still sharply alert, said, "However, Texcoco and Genoa might both profit."

Kennedy said happily, "What do we care? You gotta take the long view. What we're working out here is going to be used on half a million planets eventually." He tried to snap his fingers. "These two lousy planets don't count that much." He succeeded in snapping them this time. "Not that much."

Barry Watson said, "You're stoned, Kennedy."

"Why not?" Kennedy grinned. "Finally perfected a decent brandy. I'll have to send you a few cases, Barry."

"How would you go about that, Jerry?" Watson said softly.

"Shucks, man, our space lighter makes a trip to Texcoco every month or so. Gotta keep up with you boys. Maybe throw a wrench or so in the works once inna while."

Peter MacDonald said, "Shut up, Jerry. You talk too much."

"Don't talk to me that way. You'll find yourself having one helluva time floating that loan you need next month. How about another drink, everybody? This party's dead."

Watson said, "How about the progress reports? Briefly, we've all but completely united Texcoco. Minor setbacks have sometimes deterred us but the march of progress goes on. We—"

"Minor setbacks," Kennedy chortled. "Must of had to bump off five million of the poor slobs before that commune revolt was finished with."

Watson said coldly, "We always have a few reactionaries, religious fanatics, misfits, crackpots malcontents to deal with. However, these are not important. Our industrial potential has finally begun to roll. We doubled steel production this year, will do the same next. Our hydroelectric installations tripled in the past two years. Coal production is four times higher, lumber production six times. We expect to increase grain harvest forty per cent next season. And—"

The Honorable Mayer put in gently, "Please, Honorable Watson, your percentage figures are impressive only if we know from what basis you start. If you produced but five million tons of steel last year, then your growth to ten million is very good but it is still not a considerable amount for an entire planet."

Buchwald said dryly, "If our agents are correct, Texcocan steel production is something like a quarter of our own. I assume your other basic products are at about the same stage of development."

Watson flushed. "The thing to remember is that our economy continues to grow each year. Yours spurts and stops, jerks ahead a few steps, then grinds to a halt or even retreats. Everything comes to a pause if you few on the top stop making a profit; all that counts in your economy is making money. Which reminds me, how in the world did you ever get out of that planet-wide depression you were in three years ago?"

Peter MacDonald grunted his disgust. "Planet-wide depression, indeed. A small recession. A temporary readjustment due to over-extention in certain economic and financial fields."

From the other side of the table, Dick Hawkins laughed at him. "Where'd you pick up that line of gobbledygook, Peter?" he asked.

Peter MacDonald came to his feet. "I don't have to put up with this sort of impudence," he snapped.

Watson lurched to his own feet. "Nor do we have to listen to your snide cracks about the real progress Texcoco is making. We don't seem to be getting anywhere." He snapped to his associates, "Hawkins, Taller, Roberts! Let's go. Ten years from

now, there'll be another story to tell. Even a blind man will see the difference."

They marched down the *Pedagogue's* corridor toward their spaceboat.

Kennedy called after them, "Ten years from now every family on Genoa'll have a car. Wait'll you see. Television, too. We're introducing TV next year. An' civil aviation. Be all over the place in two, three years—"

The Texcocoans slammed the spaceport after them.

Kennedy sloshed some more drink into his glass. "Slobs can't stand the truth," he explained to the others.

XI.

With the exception of a few additional delegates composed of high ranking Texcocan and Genoese political and scientific heads, the line-up at the end of forty years was the same as ten years earlier—except for the absence of Jerry Kennedy.

Extra tables had been set up, and chairs to accommodate the added numbers. To one side were the Genoese: Martin Gunther, Fredric Buchwald, Peter MacDonald, with such repeat delegates as Baron Leonar, and the Honorables Modrin and Russ, and half a dozen newcomers. On the other were Barry Watson, Dick Hawkins and Natt Roberts, Taller and such Texcocans as the scientists Wiss and Fokin, army heads, Security Police officials and other notables.

Note pads had been placed before each of them and both Watson and Gunther were equipped with gavels.

While chairs were still being shuffled, Barry Watson said over the table to Gunther, "Jerry?"

Martin Gunther shrugged "Jerry's indisposed. As a matter of fact, he's at one of the mountain sanitariums, taking a cure. He'll be all right."

"Good," Dick Hawkins said. "We've lost too many."

Watson pounded with his gavel. "Let's come to order. Gunther do you have anything to say in the way of preliminaries?"

"Not especially. I believe we all know where we stand, including the newcomers from Genoa and Texcoco. In brief, this is the fourth meeting of the Earth teams that were sent to these two planets to bring backward colonists to an industralized culture. It would seem that we are both succeeding—possibly at different rates. Forty years have passed, ten remain to us."

For a moment there was silence.

Finally Roberts said, "Possibly you have already discovered this through your agents, but we have released the information on prolonging of life."

Peter MacDonald said wryly, "We, too, were pressured into such a step."

Baron Leonar said, "And why not?"

Taller, across the table from him, nodded.

Martin Gunther tapped twice on the table with his gavel. "The basic reason for our meeting is to report progress and to reconsider the possibilities of new elements having entered into the situation which might cause us to re-examine our policies. I think we already have a fairly good idea of each other's development." His voice went wry. "At least our agents do a fairly good job of reporting yours."

"And ours, yours," Watson rapped.

"However," MacDonald said, "now that we are drawing near the end of our half century, I think it becomes obvious that Amschel Mayer's original contention—that a freely competitive economy grows faster than one restricted by totalitarian bounds—has been proven."

Barry Watson snorted amusement. "Do you?" he said. "To the contrary, MacDonald. The proof is otherwise. On Genoa you still have comparative confusion. True enough, several of your nations, particularly those on your southern continent, are greatly advanced and with a high living and cultural standard—when times are good. But at the same time you have other whole peoples who are little, if any, better off, than when you arrived. On the western continent you even have a few feudalistic regimes that are probably worse off—mostly as a result of the wars you've crippled them with."

Natt Roberts said, his voice musing, "But even that isn't the important thing. The Co-ordinator sent us here to find a *method* of bringing backward cultures to industrialization. Have you got a blueprint to show him, when you return? Can you trace out the history of Genoa for this past half century and say, this war was necessary for progress—but that

should have been avoided? Or is this whole *free competition* program of yours actually nothing but chaos which *sometimes* works out wonderfully for *some* nations, but actually destroys others? You have scorned our methods, our collectivized society —but when we return, we'll have a blueprint of how we arrived where we are."

Gunther banged the table with his gavel. "Just a moment. Is there any reason why we have to listen to these accusations when—"

Watson held up a hand, curtly, "Let us finish. If you have something to say, we'll gladly listen when we're through."

Gunther was flushed but he snapped, "Go ahead then, but don't think any of we Genoese are being taken in."

Watson said, "True enough, it took us a time to unite our people . . ."

"Time and blood," Peter MacDonald muttered.

". . . But once underway the Texcocan State has moved on in a progression unknown in any of the Genoese nations. To industrialize a society you must reach a certain taking off point, a point where you have sufficient industry, particularly steel, sufficient power, sufficient scientists, technicians and skilled workers. Once that point has been reached you can move in almost a geometric progression. You build a steel mill and with the steel produced you build two more mills the following year, which in turn gives you the material for four the next year."

Buchwald grunted his disbelief.

Watson looked up and down the line of Genoese, the Earthmen as well as the natives. "On Texcoco we have now reached that point. We have a trained, eager population of over one billion persons. Our universities are turning out highly trained effectives at the rate of more than twenty million a year. We have located all the raw materials we will need. We are now under way." He looked at them in heavy amusement. "By the end of the next decade we will bury you."

Martin Gunther said calmly, "Are you through?"

"Yes. For the time," Watson nodded.

"Very well. Then this is *our* progress report. In the past forty years we have eliminated feudalism in all the more advanced countries. Even in the remote areas the pressures of our changing world are bringing them around. The populace of these countries will no longer stand to one side while the standard of living on the rest of Genoa grows so rapidly. On most of our planet, already the average family not only enjoys freedom but a way of life far in advance of that of Texcoco. Already modern housing and household appliances are everywhere. Already both land cars and aircraft are available to the majority. The nations have formed an Inter-Continental League of governments so that it is unlikely that war will ever touch us again. And this is merely a beginning. In ten years, continuing our freely competitive way of developing, all will be living on a

scale that only the wealthy can afford today."

He came to an end and stared antagonistically at the Texcocans.

Taller said, "There seems to be no agreement."

Across the table from him the ancient Honorable Russ said, "It is difficult to measure. We seem to count refrigerators and privately owned automobiles. You seem to ignore personal standards and concentrate on steel tonnage."

The Texcocan scientist, Wiss, said easily, "Given the steel mills, and eventually automobiles and refrigerators will run off our assembly lines like water, and will be available for everyone, not just those who can afford to buy them."

'Hm-m-m, eventually," Peter MacDonald laughed nastily.

The atmosphere was suddenly hostile. Hostile beyond anything that had gone before in earlier conferences.

And then Martin Gunther said without inflection, "I note that you have removed from the *Pedagogue's* library the information dealing with nuclear fission."

"For the purpose of study," Dick Hawkins said smoothly.

"Of course," Gunther said. "Did you plan to return it in the immediate future?"

"I'm afraid our studies will take some time," Watson said flatly.

"I was afraid so," Gunther said. "Happily, I took the precaution of making microfilms of the material involved more than a year ago."

Barry Watson pushed his chair back. "We seem to have accomplished what was possible by this conference," he said. "If anything." He looked to right and left at his cohorts. "Let's go."

They came stiffly erect. Watson turned on his heel and started for the door.

As they left, Natt Roberts turned for a moment and said to Gunther, "One thing, Martin. During this next ten years you might consider whether or not half a century has been enough to accomplish our task. Should we consider staying on? I would think the Co-ordinator would accept any recommendation along this line that we might make."

The Genoese contingent looked after him, long after he was gone.

Finally Martin Gunther said, "Baron Leonar, I think it might be a good idea if you began putting some of your men to work on making steel alloys suitable for spacecraft. The way things are developing, perhaps we'll be needing them."

Buchwald and MacDonald looked at him unblinkingly.

XII.

It was fifty years to a day since the *Pedagogue* had first gone into orbit about Rigel. Five decades have passed. Half a century.

Of the original crew of the *Pedagogue,* six now gathered in the lounge of the spaceship. All of them had changed physically. Some of them softer to the point of flabbiness; some harder both of body and soul.

Barry Watson, Natt Roberts, Dick Hawkins, of the Texcocan team.

Martin Gunther, Peter MacDonald, Fredric Buchwald, of the Genoese.

The gathering wasn't so large as the one before. Only Taller and the scientist Wiss attended from Texcoco; only Baron Leonar and the son of Honorable Russ from Genoa.

From the beginning they stared with hostility across the conference table. Even the pretense of amiability was gone.

Watson rapped finally. "I am not going to dwell upon the measures you have been taking that can only be construed as military ones aimed eventually at the Texcocan State."

Martin Gunther laughed nastily. "Is your implication that your own people have not taken the same measures, in fact, inaugurated them!"

Watson said, "As I say, I have no intention of even discussing this. Surely we can arrive at no agreement. There is one point, however that we should consider on this occasion."

The corpulent Peter MacDonald wheezed, "Well, out with it!"

Natt Roberts said, "I mentioned the matter to you at the last meeting."

"Ah, yes," Gunther nodded. "Just as you left. We have considered it."

The Texcocans waited for him to go on.

"If I understand you," Gunther said, "you think we should reconsider returning to Terra City at this time."

"It should be discussed," Watson nodded. "Whatever the . . . ah . . . temporary difficulties between us, the original project of the *Pedagogue* is still our duty."

The three of the Genoese team nodded their agreement.

"And the problem becomes, have we accomplished completely what we set out to do? And, further, is it necessary, or at least preferable, for us to stay on and continue administration of the progress of the Rigel planets?"

They thought about it.

Buchwald said hesitantly, "It has been my own belief that Genoa is not quite ready for us to let loose the . . . ah, reins. If we left now, I am not sure—"

Roberts said, "Same applies to Texcoco. The State has made fabulous strides, but I am not sure what would happen if we leaders were to leave. There might be a complete collapse."

Watson said, "We seem to be in basic agreement. Is a suggestion in order that we extend, for another twenty-five years, at least, this expedition's work?"

Dick Hawkins said, "The Office of Galactic Colonization—"

MacDonald said smoothly, "Will undoubtedly send out a ship to investigate. We shall simply inform them that things are not as yet propitious to our leaving, that another twenty-five years is in order. Since we are on the scene, undoubtedly our recommendation will be heeded."

Watson looked from one Earthman to the next. "We are in agreement?"

Each in turn nodded.

Peter MacDonald said, "And do you all realize that here we have a unique situation that might be exploited for the benefit of the whole race?"

They looked to him, questioningly.

"The dynamic we find in Genoa—and Texcoco, too, for that matter, though we disagree on so many fundamentals—is beyond that in the Solar System. These are new planets, new ambitions are alive. We have at our fingertips man's highest developments, evolved on Earth. But with this new dynamic, this freshness, might we not in time push even beyond old Earth?"

"You mean—" Natt Roberts said.

MacDonald nodded. "What particular of value is gained by our uniting Genoa and Texcoco with the so-called Galactic Commonwealth? Why not press ahead on our own? With the vigor of these new races we might well leave Earth far behind."

Watson mused, "Carrying your suggestion to the ultimate, who is to say that one day Rigel might not become the new center of the human race, rather than Sol?"

"A point well taken," Gunther agreed.

"No," Taller said softly.

The six Earthmen turned hostile eyes to him.

"This particular matter does not concern you, Generalissimo," Watson rapped at him.

Taller smiled his amusement at that and came to his feet.

"No," he said. "I am afraid that hard though it might be for you to give up the powers you have held so long, you Earthlings are going to have to return to Terra City, from whence you came."

Baron Leonar said in gentle agreement, "Obviously."

"What is this?" Watson rapped. "I'm not at all amused."

The Honorable Russ stood also. "There is no use prolonging this. I have heard you Earthlings say, more than once, that man adapts to preserve himself. Very well, we of Genoa and Texcoco are adapting to the present situation. We are of the belief that if you are allowed to remain in power we of the Rigel planets will be destroyed, probably in an atomic halocaust. In self-protection we have found it necessary to unite, we Genoese and Texcocans. We bear you no ill will, far to the contrary. However, it is necessary that you all return to Earth. You have impressed upon us the aforementioned truism that *man adapts* but in the *Pedagogue's* library I have found another that also applies. Power corrupts, and absolute power corrupts absolutely."

There were heavy automatics in the hands of Natt Roberts and Dick Hawkins. Barry Watson leaned back in his chair, his eyes narrow. "How'd you ever expect to get away with this sort of treason, Taller?"

Martin Gunther blurted, "Or you, Russ?"

Wiss, the Texcocan scientist, held his wrist radio to his mouth and said, "Come in now."

Dick Hawkins thumbed back the hammer of his hand gun.

"Hold it a minute, Dick," Barry Watson said. "I don't like this." To Taller he rapped, "What goes on here? Talk up, you're just about a dead man."

And it was then that they heard the scraping on the outer hull.

The six Earthmen looked at the overhead, dumfounded.

"I suggest you put up your weapons," Taller said quietly. "At this late stage I would hate to see further bloodshed."

In moments they heard the opening and closing of locks and footsteps along the corridor. The door opened and in stepped,

Joe Chessman, Amschel Mayer, Mike Dean, Louis Rosetti, and an emaciated Jerry Kennedy. Their expressions ran the gamut from sheepishness to blank haughtiness.

MacDonald bug-eyed. "Dean . . . Rosetti . . . the Temple priests burned you at the stake!"

They grinned at him, shamefaced. "Guess not," Dean said. "We were kidnaped. "We've been teaching basic science, in some phony monastery."

Watson's face was white. "Joe," he said.

"Yeah," Joe Chessman growled. "You sold me out. But Taller and the Texcocans thought I was still of some use."

Amschel Mayer snapped, bitterly, "And now if you fools will put down your stupid guns, we'll make the final arrangements for returning this expedition to Terra City. Personally, I'll be glad to get away!"

Behind the five resurrected Earthmen were a sea of faces representing the foremost figures of both Texcoco and Genoa in every field of endeavor. At least fifty of them in all.

As though protectively, the eleven Earthmen ganged together at the far side of the messtable they'd met over so often.

Martin Gunther, his expression dazed, said, "I . . . I don't—"

Taller resumed his spokesmanship. "From the first the most progressive elements on both Texcoco and Genoa realized the value of your expedition and have been in fundamental sympathy with the aims the *Pedagogue* originally had. Primitive life is not idyllic. Until man is free from nature's tyranny and has solved the basic problems of sufficient food, clothing, shelter, medical care and education for all, he is unable to realize himself. So we co-operated with you to the extent we found possible."

His smile was grim. "I am afraid that almost from the beginning, and on both planets, your very actions developed an . . . underground, I believe you call it. Not an overt one, since we needed your assistance to build the new industrialized culture you showed us was possible. We even protected you against yourselves, since it soon became obvious that if left alone you'd destroy each other in your addition to power."

Baron Leonar broke in. "Don't misunderstand. It wasn't until the past couple of decades that this

underground which had sprung up independently on both planets, amalgamated."

Barry Watson blurted, "But Joe . . . Chessman—" he refused to meet the eye of the man he'd condemned.

Taller said, "From the first you made no effort to study our customs. If you had, you'd have realized why my father allied himself to you after you'd killed Taller First. And why I did not take my revenge on Chessman after he'd killed Reif. A Khan's first training is that no personal emotion must interfere with the needs of the People. When you turned Joe Chessman over to me, I realized his education, his abilities were too great to destroy. We sent him to a mountain university and have used him profitably all these years. In fact, it was Chessman who finally brought us to space travel."

'That's right," Buchwald blurted. "You've got a spaceship out there. How could you possibly—?"

Taller said mildly, "There are but a handful of you, you could hardly keep track of two whole planets and all that went on upon them."

Amschel Mayer said bitingly, "All this can be gone over on our return to Terra City. We'll have a full year to explain to ourselves and each other why we became such complete idiots. I was originally head of this expedition—before my supposed friends railroaded me to prison—does anyone object if I take over again?"

"No," Joe Chessman growled. The others shook their heads.

Taller said, "There is but one other thing. In spite of how you may feel at this moment of embarrassment, basically you have succeeded in your task. That is, you have brought Texcoco and Genoa to an industrialized culture. We hold various reservations about how you accomplished this. However, when you return to your Co-ordinator of Galactic Colonization, please inform him that we are anxious to receive his ambassadors. The term is *ambassadors* and we will expect to meet on a basis of equality. Surely in all Earth's millennia of social evolution man has worked out something better than either of your teams have built here. We should like to be instructed."

Dick Hawkins said stiffly, "We can instruct you on Earth's present socio-economic system."

"I am afraid we no longer trust you, Richard Hawkins. Send others—uncorrupted by power, privilege or great wealth."

When they had gone and the sound of their departing spacecraft had faded, Amschel Mayer snapped, "We might as well get underway. And cheer up, confound it, we have lots of time to contrive a reasonable report for the Co-ordinator."

Jerry Kennedy managed a thin grin, almost reminiscent of the younger Kennedy of the first years on Genoa. "Say," he said, "I wonder if we'll be granted a good long vacation before being sent on another assignment."

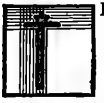
THE END

PUSHBUTTON WAR

By JOSEPH P. MARTINO

In one place, a descendant of the Vikings rode a ship such as Lief never dreamed of; from another, one of the descendants of the Caesars, and here an Apache rode a steed such as never roamed the plains. But they were warriors all.

Illustrated by Schoenherr



HE hatch swung open, admitting a blast of Arctic air and a man clad in a heavy, fur-lined parka. He quickly closed the hatch and turned to the man in the pilot's couch.

"O.K., Harry. I'll take over now. Anything to report?"

"The heading gyro in the autopilot is still drifting. Did you write it up for Maintenance?"

"Yeah. They said that to replace it they'd have to put the ship in the hangar, and it's full now with ships going through periodic inspection. I guess we'll have to wait. They can't just give us another ship, either. With the hangar full, we must be pretty close to the absolute minimum for ships on the line and ready to fly."

"O.K. Let me check out with the tower, and she'll be all yours." He thumbed the intercom button and spoke into the mike: "RI 276 to tower. Major Lightfoot going off watch."

When the tower acknowledged, he began to disconnect himself from the ship. With smooth, experienced motions, he disconnected the mike cable, oxygen hose, air pressure hose, cooling air hose, electrical heating cable, and dehumidifier hose which connected his flying suit to the ship. He donned the parka and gloves his relief had worn, and stepped through the hatch onto the gantry crane elevator. Even through the heavy parka, the cold air had a bite to it. As the elevator descended, he glanced to the south, knowing as he did so that there would be nothing to see. The sun had set on November 17th, and was not due up for three more weeks. At noon, there would be a faint glow on the southern horizon, as the sun gave a reminder of its existence, but now, at four in the morning, there was nothing. As he stepped off the elevator, the ground crew prepared to roll the gantry crane away from the ship. He opened the door of the waiting personnel carrier and swung aboard. The inevitable cry of "close that door" greeted him as he entered. He brushed the parka hood back from his head, and sank into the first empty seat. The heater struggled valiantly with the Arctic cold to keep the interior of the personnel carrier at a tolerable temperature, but it never seemed able to do much with the floor. He propped his feet on the footrest of the seat ahead of him, spoke to the other occupant of the seat.

"Hi, Mike."

"Hi, Harry. Say, what's your watch schedule now?"

"I've got four hours off, back on for four, then sixteen off. Why?"

"Well, a few of us are getting up a friendly little game before we go back on watch. I thought you might want to join us."

"Well, I—"

"Come on, now. What's your excuse this time for not playing cards?"

"To start with, I'm scheduled for a half hour in the simulator, and another half hour in the procedural trainer. Then if I finish the exam in

my correspondence course, I can get it on this week's mail plane. If I don't get it in the mail now, I'll have to wait until next week."

"All right, I'll let you off this time. How's the course coming?"

"This is the final exam. If I pass, I'll have only forty-two more credits to go before I have my degree in Animal Husbandry."

"What on earth do you want with a degree like that?"

"I keep telling you. When I retire, I'm going back to Oklahoma and raise horses. If I got into all the card games you try to organize, I'd retire with neither the knowledge to run a horse ranch, nor the money to start one."

"But why raise horses? Cabbages, I can see. Tomatoes, yes. But why horses?"

"Partly because there's always a market for them, so I'll have a fair amount of business to keep me eating regularly. But mostly because I like horses. I practically grew up in the saddle. By the time I was old enough to do much riding, Dad had his own ranch, and I helped earn my keep by working for him. Under those circumstances, I just naturally learned to like horses."

"Guess I never thought of it like that. I was a city boy myself. The only horses I ever saw were the ones the cops rode. I didn't get much chance to became familiar with the beasts."

"Well, you don't know what you missed. It's just impossible to describe what it's like to use a high-spirited and well-trained horse in your daily work. The horse almost gets to sense what you want him to do next. You don't have to direct his every move. Just a word or two, and a touch with your heel or the pressure of your knee against his side, and he's got the idea. A well-trained horse is perfectly capable of cutting a particular cow out of a herd without any instructions beyond showing him which one you want."

"It's too bad the Army did away with the cavalry. Sounds like you belong there, not in the Air Force."

"No, because if there's anything I like better than riding a good horse, it's flying a fast and responsive airplane. I've been flying fighters for almost seventeen years now, and I'll be quite happy to keep flying them as long as they'll let me. When I can't fly fighters any more, then I'll go back to horses. And much as I like horses, I hope that's going to be a long time yet."

"You must hate this assignment, then. How come I never hear you complain about it?"

"The only reason I don't complain about this assignment is that I volunteered for it. And I've been kicking myself ever since. When I heard about the Rocket Interceptors, I was really excited. Imagine a plane fast enough to catch up with an invading ballistic missile and shoot it down. I decided this was for me, and jumped at the assignment. They sounded like the hot fighter planes to end all hot fighter planes. And what do I

find? They're so expensive to fly that we don't get any training missions. I've been up in one just once, and that was my familiarization flight, when I got into this assignment last year. And then it was only a ride in the second seat of that two-seat version they use for checking out new pilots. I just lay there through the whole flight. And as far as I could see, the pilot didn't do much more. He just watched things while the autopilot did all the work."

"Well, don't take it too hard. You might get some flights."

"That's true. They do mistake a meteor for a missile now and then. But that happens only two or three times a year. That's not enough. I want some regular flying. I haven't got any flying time in for more than a year. The nearest I come to flying is my time in the procedural trainer, to teach me what buttons to push, and in the simulator, to give me the feel of what happens when I push the buttons."

"That's O.K. They still give you your flying pay."

"I know, but that's not what I'm after. I fly because I love flying. I use the flying pay just to keep up the extra premiums the insurance companies keep insisting on so long as I indulge my passion for fighter planes."

"I guess about the only way you could get any regular flying on this job would be for a war to come along."

"That's about it. We'd fly just as often as they could recover our ships and send us back up here for another launch. And that would go on until the economy on both sides broke down so far they couldn't make any more missiles for us to chase, or boosters to send us up after them. No thanks. I don't want to fly that badly. I like civilization."

"In the meantime, then, you ought to try to enjoy it here. Where else can you spend most of your working hours lying flat on your back on the most comfortable couch science can devise?"

"That's the trouble. Just lying there, where you can't read, write, talk, or listen. It might be O.K. for a hermit, but I'd rather fly fighter planes. Here's the trainer building. I've got to get out."

Seven o'clock. Harry Lightfoot licked the flap on the envelope, sealed it shut, stuck some stamps on the front, and scrawled "AIR MAIL" under the stamps. He dropped the letter into the "STATESIDE" slot. The exam hadn't been so bad. What did they think he was, anyway? A city slicker who had never seen a live cow in his life? He ambled into the off-duty pilots' lounge. He had an hour to kill before going on watch, and this was as good a place as any to kill it. The lounge was almost empty. Most of the pilots must have been asleep. They couldn't all be in Mike's game. He leaned over a low table in the center of the room and started sorting through the stack of magazines.

"Looking for anything in particular, Harry?"

He turned to face the speaker. "No, just going through these fugitives from a dentist's office to see if there's anything I haven't read yet. I can't figure out where all the new magazines go. The ones in here always seem to be exactly two months old."

"Here's this month's *Western Stories*. I just finished it. It had some pretty good stories in it."

"No, thanks, the wrong side always wins in that one."

"The wrong . . . oh, I forgot. I guess they don't write stories where your side wins."

"It's not really a question of 'my side'. My tribe gave up the practice of tribal life and tribal customs over fifty years ago. I had the same education in a public school as any other American child. I read the same newspapers and watch the same TV shows as anyone else. My Apache ancestry means as little to me as the nationality of his immigrant ancestors means to the average American. I certainly don't consider myself to be part of a nation still at war with the 'palefaces'."

"Then what's wrong with Western stories where the United States Cavalry wins?"

"That's a different thing entirely. Some of the earliest memories I have are of listening to my grandfather tell me about how he and his friends fought against the horse-soldiers when he was a young man. I imagine he put more romance than historical accuracy into his stories. After all, he was telling an eager kid about the adventures he'd had over fifty years before. But at any rate, he definitely fixed my emotions on the side of the Indians and against the United States Cavalry. And the fact that culturally I'm descended from the Cavalry rather than from the Apache Indians doesn't change my emotions any."

"I imagine that would have a strong effect on you. These stories are really cheering at the death of some of your grandfather's friends."

"Oh, it's worse than that. In a lot of hack-written stories, the Indians are just convenient targets for the hero to shoot at while the author gets on with the story. Those stories are bad enough. But the worst are the ones where the Indians are depicted as brutal savages with no redeeming virtues. My grandfather had an elaborate code of honor which governed his conduct in battle. It was different from the code of the people he fought, but it was at least as rigid, and deviations from it were punished severely. He'd never read Clausewitz. To him, war wasn't an 'Instrument of National Policy'. It was a chance for the individual warrior to demonstrate his skill and bravery. His code put a high premium on individual courage in combat, and the weakling or coward was crushed contemptuously. I don't even attempt to justify the Indian treatment of captured civilians and noncombatants, but nevertheless, I absorbed quite a few of my grandfather's ideals and views about war,

and it's downright disgusting to see him so falsely represented by the authors of the run-of-the-mill Western story or movie."

"Well, those writers have to eat, too. And maybe they can't hold an honest job. Besides, you don't still look at war the way your grandfather did, do you? Civilization requires plenty of other virtues besides courage in combat, and we have plenty of better ways to display those virtues. And the real goal of the fighting man is to be alive after the war so he can go home to enjoy the things he was fighting for."

"No, I hadn't been in Korea long before I lost any notions I might have had of war as the glorious adventure my grandfather described it to be. It's nothing but a bloody business, and should be resorted to only if everything else fails. But I still think the individual fighter could do a lot worse than follow the code that my grandfather believed in."

"That's so, especially since the coward usually gets shot anyway; if not by the enemy, then by his own side. Hey, it's getting late! I've got some things to do before going on watch. Be seeing you."

"O.K. I'll try to find something else here I haven't read yet."

Eight o'clock. Still no sign of the sun. The stars didn't have the sky to themselves, however. Two or three times a minute a meteor would be visible, most of them appearing to come from a point about halfway between the Pole Star and the eastern horizon. Harry Lightfoot stopped the elevator, opened the hatch, and stepped in.

"She's all yours, Harry. I've already checked out with the tower."

"O.K. That gyro any worse?"

"No, it seems to have steadied a bit. Nothing else gone wrong, either."

"Looks like we're in luck for a change."

"Let me have the parka and I'll clear out. I'll think of you up here while I'm relaxing. Just imagine; a whole twenty-four hours off, and not even any training scheduled."

"Someone slipped up, I'll bet. By the way, be sure to look at the fireworks when you go out. They're better now than I've seen them at any time since they started."

"The meteor shower, you mean? Thanks. I'll take a look. I'll bet they're really cluttering up the radar screens. The Launch Control Officer must be going quietly nuts."

The Launch Control Officer wasn't going nuts. Anyone who went nuts under stress simply didn't pass the psychological tests required of prospective Launch Control Officers. However, he was decidedly unhappy. He sat in a dimly-lighted room, facing three oscilloscope screens. On each of them a pie-wedge section was illuminated by a white line which swept back and forth like a windshield wiper. Unlike a windshield wiper, however, it put little white blobs on the screen, instead of removing them. Each blob represented

something which had returned a radar echo. The center screen was his own radar. The outer two were televised images of the radar screens at the stations a hundred miles on either side of him, part of a chain of stations extending from Alaska to Greenland. In the room, behind him, and facing sets of screens similar to his, sat his assistants. They located the incoming objects on the screen and set automatic computers to determining velocity, trajectory, and probable impact point.

This information appeared as coded symbols beside the tracks on the center screen of the Launch Control Officer, as well as all duplicate screens. The Launch Control Officer, and he alone, had the responsibility to determine whether the parameters for a given track were compatible with an invading Intercontinental Ballistic Missile, or whether the track represented something harmless. If he failed to launch an interceptor at a track that turned out to be hostile, it meant the death of an American city. However, if he made a habit of launching interceptors at false targets, he would soon run out of interceptors. And only under the pressure of actual war would the incredible cost of shipping in more interceptors during the winter be paid without a second thought. Normally, no more could be shipped in until spring. That would mean a gap in the chain that could not be covered adequately by interceptors from the adjacent stations. ?

His screens were never completely clear. And to complicate things, the Quadrantids, which start every New Year's Day and last four days, were giving him additional trouble. Each track had to be analyzed, and the presence of the meteor shower greatly increased the number of tracks he had to worry about. However, the worst was past. One more day and they would be over. The clutter on his screens would drop back to normal.

Even under the best of circumstances, his problem was bad. He was hemmed in on one side by physics, and on the other by arithmetic. The most probable direction for an attack was from over the Pole. His radar beam bent only slightly to follow the curve of the Earth. At great range, the lower edge of the beam was too far above the Earth's surface to detect anything of military significance. On a minimum altitude trajectory, an ICBM aimed for North America would not be visible until it reached 83° North Latitude on the other side of the Pole. One of his interceptors took three hundred eighty-five seconds to match trajectories with such a missile, and the match occurred only two degrees of latitude south of the station. The invading missile traveled one degree of latitude in fourteen seconds. Thus he had to launch the interceptor when the missile was twenty-seven degrees from intercept. This turned out to be 85° North Latitude on the other side of the Pole. This left him at most thirty seconds to decide whether or not to intercept a track

crossing the Pole. And if several tracks were present, he had to split that time among them. If too many tracks appeared, he would have to turn over portions of the sky to his assistants, and let them make the decisions about launching. This would happen only if he felt an attack was in progress, however.

Low-altitude satellites presented him with a serious problem, since there is not a whole lot of difference between the orbit of such a satellite and the trajectory of an ICBM. Fortunately most satellite orbits were catalogued and available for comparison with incoming tracks. However, once in a while an unannounced satellite was launched, and these could cause trouble. Only the previous week, at a station down the line, an interceptor had been launched at an unannounced satellite. Had the pilot not realized what he was chasing and held his fire, the international complications could have been serious. It was hard to imagine World War III being started by an erroneous interceptor launching, but the State Department would be hard put to soothe the feelings of some intensely nationalistic country whose expensive new satellite had been shot down. Such mistakes were bound to occur, but the Launch Control Officer preferred that they be made when someone else, not he, was on watch. For this reason he attempted to anticipate all known satellites, so they would be recognized as soon as they appeared.

According to the notes he had made before coming on watch, one of the UN's weather satellites was due over shortly. A blip appeared on the screen just beyond the 83° latitude line, across the Pole. He checked the time with the satellite ephemeris. If this were the satellite, it was ninety seconds early. That was too much error in the predicted orbit of a well-known satellite. Symbols sprang into existence beside the track. It was not quite high enough for the satellite, and the velocity was too low. As the white line swept across the screen again, more symbols appeared beside the track. Probable impact point was about 40° Latitude. It certainly wasn't the satellite. Two more blips appeared on the screen, at velocities and altitudes similar to the first. Each swipe of the white line left more new tracks on the screen. And the screens for the adjacent stations were showing similar behavior. These couldn't be meteors.

The Launch Control Officer slapped his hand down on a red push-button set into the arm of his chair, and spoke into his mike. "Red Alert. Attack is in progress." Then switching to another channel, he spoke to his assistants: "Take your pre-assigned sectors. Launch one interceptor at each track identified as hostile." He hadn't enough interceptors to double up on an attack of this size, and a quick glance at the screens for the adjacent stations showed he could expect no help from them. They would have their hands full. In theory, one interceptor could handle a missile all by itself. But the

theory had never been tried in combat. That lack was about to be supplied.

Harry Lightfoot heard the alarm over the intercom. He vaguely understood what would happen before his launch order came. As each track was identified as hostile, a computer would be assigned to it. It would compute the correct time of launch, select an interceptor, and order it off the ground at the correct time. During the climb to intercept, the computer would radio steering signals to the interceptor, to assure that the intercept took place in the most efficient fashion. He knew RI 276 had been selected when a green light on the instrument panel flashed on, and a clock dial started indicating the seconds until launch. Just as the clock reached zero, a relay closed behind the instrument panel. The solid-fuel booster ignited with a roar. He was squashed back into his couch under four gees' acceleration.

Gyroscopes and acceleration-measuring instruments determined the actual trajectory of the ship; the navigation computer compared the actual trajectory with the trajectory set in before take-off; when a deviation from the pre-set trajectory occurred, the autopilot steered the ship back to the proper trajectory. As the computer on the ground obtained better velocity and position information about the missile from the ground radar, it sent course corrections to the ship, which were accepted in the computer as changes to the pre-set trajectory. The navigation computer hummed and buzzed; lights flickered on and off on the instrument panel; relays clicked behind the panel. The ship steered itself toward the correct intercept point. All this automatic operation was required because no merely human pilot had reflexes fast enough to carry out an intercept at twenty-six thousand feet per second. And even had his reflexes been fast enough, he could not have done the precise piloting required while being pummeled by this acceleration.

As it was, Major Harry Lightfoot, fighter pilot, lay motionless in his acceleration couch. His face was distorted by the acceleration. His breathing was labored. Compressed-air bladders in the legs of his gee-suit alternately expanded and contracted, squeezing him like the obscene embrace of some giant snake, as the gee-suit tried to keep his blood from pooling in his legs. Without the gee-suit, he would have blacked out, and eventually his brain would have been permanently damaged from the lack of blood to carry oxygen to it.

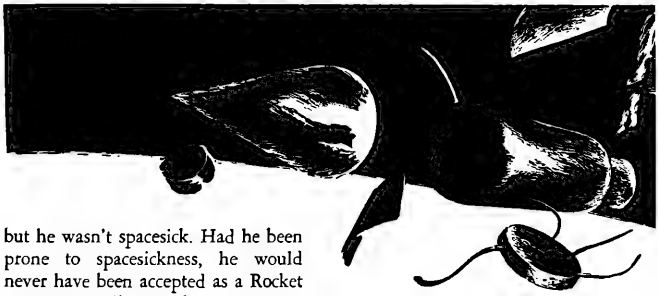
A red light on the instrument panel blinked balefully at him as it measured out the oxygen he required. Other instruments on the panel informed him of the amount of cooling air flowing through his suit to keep his temperature within the tolerable range, and the amount of moisture the de-humidifier had to carry away from him so that his suit didn't become a steam-bath. He was sur-

rounded by hundreds of pounds of equipment which added nothing to the performance of the ship; which couldn't be counted as payload; which cut down on the speed and altitude the ship might have reached without them. Their sole purpose was to keep this magnificent high-performance, self-steering machine from killing its load of fragile human flesh.

At one hundred twenty-eight seconds after launch, the acceleration suddenly dropped to zero. He breathed deeply again, and swallowed repeatedly to get the salty taste out of his throat. His stomach was uneasy, but he wasn't spacesick. Had he been prone to spacesickness, he would never have been accepted as a Rocket Interceptor pilot. Rocket Interceptor pilots had to be capable of taking all the punishment their ships could dish out.

He knew there would be fifty seconds of free-fall before the rockets fired again. One solid-fuel stage had imparted to the ship a velocity which would carry it to the altitude of the missile it was to intercept. A second solid-fuel stage would match trajectories with the missile. Final corrections would be made with the liquid-fuel rockets in the third stage. The third stage would then become a glider which eventually would carry him back to Earth.

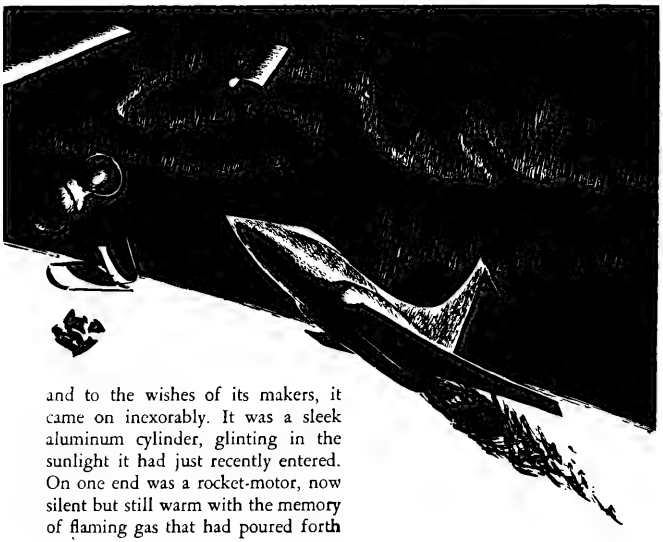
Before the second stage was fired, however, the ship had to be oriented properly. The autopilot consulted its gyros, took some star sights, and asked the navigation computer some questions. The answers came back in seconds, an interval which was several hours shorter than a human pilot would have required. Using the answers, the autopilot started to swing the ship about, using small compressed-gas jets for the purpose. Finally, satisfied with the ship's orientation, the autopilot rested. It patiently awaited the moment, precisely calculated by the computer on the ground, when it would fire the second stage.



Major Harry Lightfoot, fighter pilot, waited idly for the next move

of his ship. He could only fume inwardly. This was no way for an Apache warrior to ride into battle. What would his grandfather think of a steed which directed itself into battle and which could kill its rider, not by accident, but in its normal operation? He should be actively hunting for that missile, instead of lying here, strapped into his couch so he wouldn't hurt himself, while the ship did all the work.

As for the missile, it was far to the north and slightly above the ship. Without purpose of its own, but obedient to the laws of Mr. Newton and to the wishes of its makers, it came on inexorably. It was a sleek aluminum cylinder, glinting in the sunlight it had just recently entered. On one end was a rocket-motor, now silent but still warm with the memory of flaming gas that had poured forth from it only minutes ago. On the other end was a sleek aerodynamic shape, the product of thousands of hours of design work. It was designed to enter the atmosphere at meteoric speed, but without burning up. It was intended to survive the passage through the air and convey its contents intact to the ground. The contents might have been virulent bacteria or toxic gas, according to the intentions of its makers. Among its brothers elsewhere in the sky this morning, there were such noxious loads. This one, however, was carrying the complex mechanism of a



hydrogen bomb. Its destination was an American city; its object to replace that city with an expanding cloud of star-hot gas.

Suddenly the sleek cylinder disappeared in a puff of smoke, which quickly dissipated in the surrounding vacuum. What had been a precisely-built rocket had been reduced, by carefully-placed charges of explosive, to a collection of chunks of metal. Some were plates from the skin and fuel tanks. Others were large lumps from the computer-banks, gyro platform, fuel pumps, and other more massive components. This was not wanton destruction, however. It was more careful planning by the same brains which had devised the missile itself. To a radar set on the ground near the target, each fragment was indistinguishable from the nose cone carrying the warhead. In fact, since the fragments were separating only very slowly, they never would appear as distinct objects. By the time the cloud of decoys entered the atmosphere, its more than two dozen members would appear to the finest radar available on the ground as a single echo twenty-five miles across. It would be a giant haystack in the sky, concealing the most deadly needle of all time. No ground-controlled intercept scheme had any hope of selecting the warhead from among that deceptive cloud and destroying it.

The cloud of fragments possessed the same trajectory as the missile originally had. At the rate it was overtaking RI 276, it would soon pass the ship by. The autopilot of RI 276 had no intention of letting this happen, of course. At the correct instant, stage two thundered into life, and Harry Lightfoot was again smashed back into his acceleration couch. Almost absentmindedly, the ship continued to minister to his needs. Its attention was focused on its mission. After a while, the ground computer sent some instructions to the ship. The navigation computer converted these into a direction, and pointed a radar antenna in that direction. The antenna sent forth a stream of questing pulses, which quickly returned, confirming the direction and distance to the oncoming cloud of missile fragments. A little while later, fuel pumps began to whine somewhere in the tail of the ship. Then the acceleration dropped to zero as the second-stage thrust was terminated. There was a series of thumps as explosive bolts released the second stage. The whine of the pumps dropped in pitch as fuel gushed through them, and acceleration returned in a rush. The acceleration lasted for a few seconds, tapered off quickly, and ended. A light winked on on the instrument panel as the ship announced its mission was accomplished.

Major Harry Lightfoot, fighter pilot, felt a glow of satisfaction as he saw the light come on. He might not have reflexes fast enough to pilot the ship up here; he might not be able to survive the climb to intercept without the help of a lot of

fancy equipment; but he was still necessary. He saw still one step ahead of this complex robot which had carried him up here. It was his human judgment and his ability to react correctly in an unpredictable situation which were needed to locate the warhead from among the cluster of decoys and destroy it. This was a job no merely logical machine could do. When all was said and done, the only purpose for the existence of this magnificent machine was to put him where he was now; in the same trajectory as the missile, and slightly behind it.

Harry Lightfoot reached for a red-handled toggle switch at the top of the instrument panel, clicked it from AUTO to MANUAL, and changed his status from passenger to pilot. He had little enough time to work. He could not follow the missile down into the atmosphere; his ship would burn up. He must begin his pull-out at not less than two hundred miles altitude. That left him one hundred eighty-three seconds in which to locate and destroy the warhead. The screen in the center of his instrument panel could show a composite image of the space in front of his ship, based on data from a number of sensing elements and detectors. He switched on an infrared scanner. A collection of spots appeared on the screen, each spot indicating by its color the temperature of the object it represented. The infrared detector gave him no range information, of course. But if the autopilot had done its job well, the nearest fragment would be about ten miles away. Thus even if he set off the enemy warhead, he would be safe. At that range the ship would not suffer any structural damage from the heat, and he could be down on the ground and in a hospital before any radiation effects could become serious.

He reflected quickly on the possible temperature range of the missile components. The missile had been launched from Central Asia, at night, in January. There was no reason to suppose that the warhead had been temperature-controlled during the pre-launch countdown. Thus it probably was at the ambient temperature of the launch site. If it had been fired in the open, that might be as low as minus 70° F. Had it been fired from a shelter, that might be as high as 70° F. To leave a safety margin, he decided to reject only those objects outside the range plus or minus 100° F. There were two fragments at 500° F. He rejected these as probably fragments of the engine. Six more exhibited a temperature of near minus 320° F. These probably came from the liquid oxygen tanks. They could be rejected. That eliminated eight of the objects on the screen. He had nineteen to go. It would be a lot slower for the rest, too.

He switched on a radar transmitter. The screen blanked out almost completely. The missile had included a micro-wave transmitter, to act as a jammer. It must have been triggered on by his approach. It obviously

hadn't been operating while the ship was maneuvering into position. Had it been transmitting then, the autopilot would simply have homed on it. He switched the radar to a different frequency. That didn't work. The screen was still blank, indicating that the jammer was sweeping in frequency. He next tried to synchronize his radar pulses with the jammer, in order to be looking when it was quiet. The enemy, anticipating him, had given the jammer a variable pulse repetition rate. He switched off the transmitter, and scanned the radar antenna manually. He slowly swung it back and forth, attempting to fix the direction of the jammer by finding the direction of maximum signal strength. He found that the enemy had anticipated him again, and the jammer's signal strength varied. However, he finally stopped the antenna, satisfied that he had it pointed at the jammer. The infrared detector confirmed that there was something in the direction the antenna pointed, but it appeared too small to be the warhead.

He then activated the manual piloting controls. He started the fuel pumps winding up, and swung the ship to point normal to the line-of-sight to the jammer. A quick blast from the rockets sent the image of the jammer moving sideways across the screen. But, of greater importance, two other objects moved across the screen faster than the jammer, indicating they were nearer the ship than was the jammer. He picked the one which appeared the nearest to him, and with a series of maneuvers and blasts from the rockets placed the object between himself and the jammer. He switched the radar on again. Some of the jammer signal was still leaking through, but the object, whatever it was, made an effective shield. The radar images were quite sharp and clear.

He glanced at the clock. Nullifying the jammer had cost him seventy-five seconds. He'd have to hurry, in order to make up for that time. The infrared detector showed two targets which the radar insisted weren't there. He shifted radar frequency. They still weren't there. He decided they were small fragments which didn't reflect much radar energy, and rejected them. He set the radar to a linearly polarized mode. Eight of the targets showed a definite amplitude modulation on the echo. That meant they were rotating slowly. He switched to circular polarization, to see if they presented a constant area to the radar beam. He compared the echoes for both modes of polarization. Five of the targets were skin fragments, spinning about an axis skewed with respect to the radar beam. These he rejected. Two more were structural spars. They couldn't conceal a warhead. He rejected them. After careful examination of the fine structure of the echo from the last object, he was able to classify it as a large irregular mass, probably a section of computer, waving some cables about. Its irregularity weighed against its containing the warhead. Even if it didn't burn up

in the atmosphere, its trajectory would be too unpredictable.

He turned to the rest of the targets. Time was getting short. He extracted every conceivable bit of information out of what his detectors told him. He checked each fragment for resonant frequencies, getting an idea of the size and shape of each. He checked the radiated infrared spectrum. He checked the decrement of the reflected radar pulse. Each scrap of information was an indication about the identity of the fragments. With frequent glances at the clock, constantly reminding him of how rapidly his time was running out, he checked and cross-checked the data coming in to him. Fighting to keep his mind calm and his thoughts clear, he deduced, inferred, and decided. One fragment after another, he sorted, discarded, rejected, eliminated, excluded. Until the screen was empty.

Now what? Had the enemy camouflaged the warhead so that it looked like a section of the missile's skin? Not likely. Had he made a mistake in his identification of the fragments? Possibly, but there wasn't time to recheck every fragment. He decided that the most likely event was that the warhead was hidden by one of the other fragments. He swung the ship; headed it straight for the object shielding him from the jammer, which had turned out to be a section from the fuel tank. A short blast from the rockets sent him drifting toward the object. One image on the screen broadened; split in two. A hidden fragment emerged from behind one of the ones he had examined. He rejected it immediately. Its temperature was too low. He was almost upon the fragment shielding him from the jammer. If he turned to avoid it, the jammer would blank out his radar again. He thought back to his first look at the cloud of fragments. There had been nothing between his shield and the jammer. The only remaining possibility, then, was that the warhead was being hidden from him by the jammer itself. He would have to look on the other side of the jammer, using the ship itself as a shield.

He swung out from behind the shielding fragment, and saw his radar images blotted out. He switched off the radar, and aimed the ship slightly to one side of the infrared image of the jammer. Another blast from the rockets sent him towards the jammer. Without range information from the radar, he would have to guess its distance by noting the rate at which it swept across the screen. The image of the jammer started to expand as he approached it. Then it became dumbbell shaped and split in two.

As he passed by the jammer, he switched the radar back on. That second image was something which had been hidden by the jammer. He looked around. No other new objects appeared on the screen. This had to be the warhead. He checked it anyway. Temperature was minus 40° F. A smile flickered on his lips as he caught the significance of the tem-

perature. He hoped the launching crew had gotten their fingers frozen off while they were going through the countdown. The object showed no anomalous radar behavior. Beyond doubt, it was the warhead.

Then he noted the range. A mere thirteen hundred yards! His own missile carried a small atomic warhead. At that range it would present no danger to him. But what if it triggered the enemy warhead? He and the ship would be converted into vapor within microseconds. Even a partial, low-efficiency explosion might leave the ship so weakened that it could not stand the stresses of return through the atmosphere. Firing on the enemy warhead at this range was not much different from playing Russian Roulette with a fully-loaded revolver.

Could he move out of range of the explosion and then fire? No. There were only twelve seconds left before he had to start the pull-out. It would take him longer than that to get to a safe range, get into position, and fire. He'd be dead anyway, as the ship plunged into the atmosphere and burned up. And to pull out without firing would be saving his own life at the cost of the lives he was under oath to defend. That would be sheer cowardice.

He hesitated briefly, shrugged his shoulders as well as he could inside his flying suit, and snapped a switch on the instrument panel. A set of cross hairs sprang into existence on the screen. He gripped a small lever which projected up from his right armrest; curled his thumb over the firing button on top of it. Moving the lever, he caused the cross hairs to center on the warhead. He flicked the firing button, to tell the fire control system that *this* was the target. A red light blinked on, informing him that the missile guidance system was tracking the indicated target.

He hesitated again. His body tautened against the straps holding it in the acceleration couch. His right arm became rigid; his fingers petrified. Then, with a convulsive twitch of his thumb, he closed the firing circuit. He stared at the screen, unable to tear his eyes from the streak of light that leaped away from his ship and toward the target. The missile reached the target, and there was a small flare of light. His radiation counter burped briefly. The target vanished from the radar, but the infrared detector insisted there was a nebulous fog of hot gas, shot through with a rain of molten droplets, where the target had been. That was all. He had destroyed the enemy warhead without setting it off. He stabbed the MISSION ACCOMPLISHED button, and flicked the red-handled toggle switch, resigning his status as pilot. Then he collapsed, nerveless, into the couch.

The autopilot returned to control. It signaled the Air Defense network that this hostile track was no longer dangerous. It received instructions about a safe corridor to return to the ground, where it would not be shot at. As soon as the air was thick

enough for the control surfaces to bite, the autopilot steered into the safe corridor. It began the slow, tedious process of landing safely. The ground was still a long way down. The kinetic and potential energy of the ship, if instantly transformed into heat, was enough to flash the entire ship into vapor. This tremendous store of energy had to be dissipated without harm to the ship and its occupant.

Major Harry Lightfoot, fighter pilot, lay collapsed in his couch, exhibiting somewhat less ambition than a sack of meal. He relaxed to the gentle massage of his gee-suit. The oxygen control winked reassuringly at him as it maintained a steady flow. The cabin temperature soared, but he was aware of it only from a glance at a thermometer; the air conditioning in his suit automatically stepped up its pace to keep him comfortable. He reflected that this might not be so bad after all. Certainly none of his ancestors had ever had this comfortable a ride home from battle.

After a while, the ship had reduced its speed and altitude to reasonable values. The autopilot requested, and received, clearance to land at its preassigned base. It lined itself up with the runway, precisely followed the correct glide-path, and flared out just over the end of the runway. The smoothness of the touchdown was broken only by the jerk of the drag parachute popping open. The ship came to a halt near the other end of the runway. Harry Lightfoot disconnected himself from the ship and opened the hatch. Carefully avoiding contact with the still-hot metal skin of the ship, he jumped the short distance to the ground. The low purr of a motor behind him announced the arrival of a tractor to tow the ship off the runway.

"You'll have to ride the tractor back with me, sir. We're a bit short of transportation now."

"O.K., sergeant. Be careful hooking up. She's still hot."

"How was the flight, sir?"

"No sweat. She flies herself most of the time."

THE END

THE ANALYTICAL LABORATORY

PLACE	STORY	AUTHOR	POINTS
1.	Out Like a Light (Pt. 1)	Mark Phillips	1.74
2.	The Measure of a Man	Randall Garrett	3.06
3.	The Misplaced Battleship	Harry Harrison	3.12
4.	The Ambulance Made Two Trips	Murray Leinster	3.48
5.	Make Mine Homogenized	Rick Raphael	3.58

THE EDITOR.

REPORT

ON THE NATURE OF THE LUNAR SURFACE

By JOHN BRUNNER

Maybe it isn't true, and never has been true . . . but maybe it will be just as they always said at that . . .

Illustrated by Schoenherr

From: Officer commanding Moonbase One.

To: Officer commanding Project Diana.

Subject: Experimental verification of composition of Moon's surface.

As a result of our successful attempt to establish a manned post on the surface of the Moon, we are now in a position to give a definite answer to a problem which has long occupied the minds of astronomers: viz., the composition of the surface of our satellite.

Prior to our recent landing there were three hypotheses current. The two generally accepted among experts were, first, that the surface of the Moon consisted of a substance not unlike the ash and lava poured out by terrestrial volcanoes; or, second, that much of the Moon was covered in fine dust, the result of a continual bombardment by meteoric particles, and consequently similar in its chemical composition to the dust existing in interplanetary space.

It is, however, the third hypothesis —even more widely held than the preceding two—which has been strikingly confirmed by our on-the-spot investigations.

Before going into precise details, it is necessary to refer briefly to two other points. To start with, according to current theories about the formation of the solar system, the Earth and the Moon were not—as formerly held—originally balls of hot gas. They are presumed to have condensed out of a rotating cloud of comparatively cold gases and dust particles. It is suspected that the complex organic molecules which later gave rise to life, as we know it may, already had been in existence when the planets formed.

Scientists gave it as their considered opinion that, although they were unable to detect any living creatures on our satellite, nonetheless the raw material, so to speak, from which life developed on Earth, might exist here. It will be recalled that every possible care was taken to sterilize all rockets launched towards the Moon, for fear that the presence of terrestrial bacteria might contaminate and perhaps catalyze this stockpile of pre-organic molecules, depriving us of valuable clues to the origin of life.

Second, it will be recalled that, during the reconnaissance which preceded our successful landing, one of the TV scanner missiles searching for a suitable landing place went off course and crashed not far from the site which was eventually chosen for our base. Since our arrival we have carefully inspected the wreckage. The difficulties under which we are now compelled to work have delayed the preparation of a full report on this inspection; that will follow.

The crucial point which emerged, however, was that the TV scanner missile went off course owing to foreign matter in its guidance system. It is requested that inquiries be instituted among the technicians at the launching base with a view to establishing responsibility for this—it should not in my submission be hard

to discover which of the staff is so inordinately fond of his stomach that he takes sandwiches on the job, puts them down while at work and forgets about them. Because that was the nature of the foreign matter we found: a large sandwich with one bite taken out of it.

The impact, naturally, had broken the rocket wide open, and the sandwich was in fact found a short distance away where it had been thrown by the violence of the crash. It is now, I am afraid, purely a matter for speculation whether the content of the sandwich had a uniquely determinant effect; speaking for myself, I'm pretty sure it did.

The scientists responsible for predicting that terrestrial bacteria might contaminate pre-organic molecules on the Moon deserve congratulation for the accuracy of their guesswork. The man who left this sandwich in the scanner missile deserves to be hanged, drawn and quartered—but that's up to you at base. An alternative suggestion is to bury him up to his neck in a barrel full of the nice ripe Limburger he likes in his sandwiches, till he won't be able to look the stuff in the face again. Then he'll know how we feel sitting up here, having to breathe the stink with every lungful of canned air.

In fact, you'll probably notice the aroma on this memo.

I am in a position to state with authority that thanks to his sandwich the Moon is made of green cheese.

THE END

IN TIMES TO COME

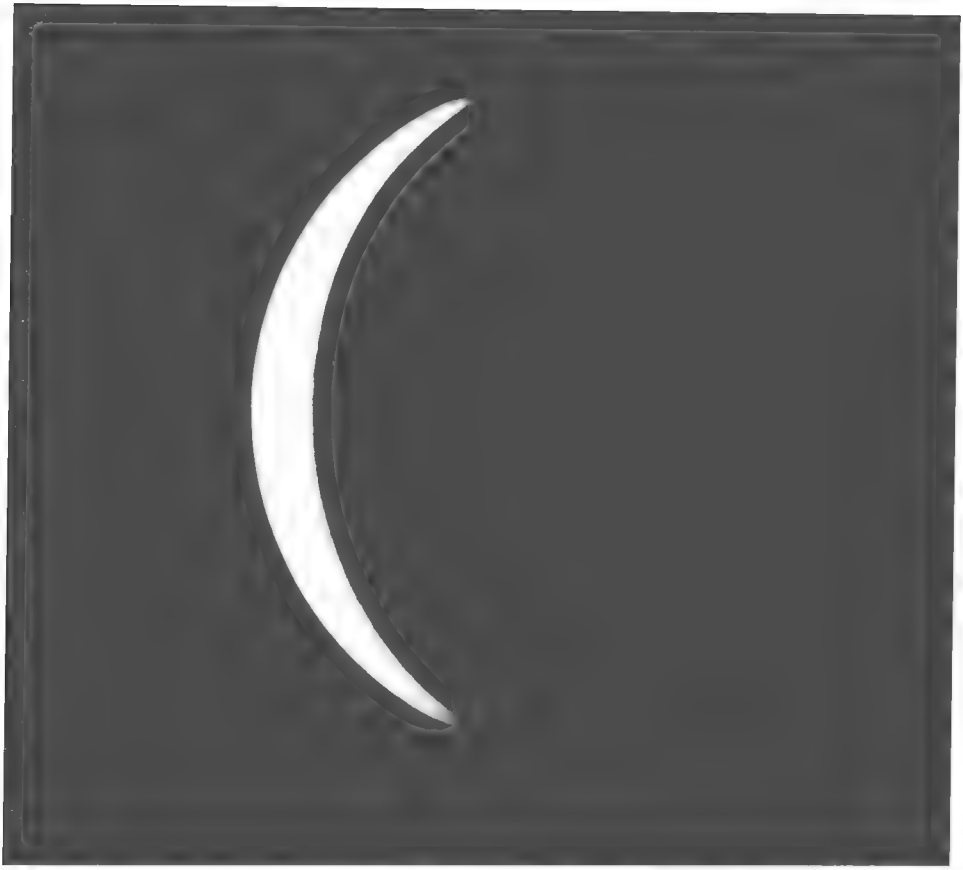
It's been said repeatedly, by many people, that Creativity is a one-man business. It's been said so often and so authoritatively that—if Hitler was right about the Big Lie business—it would be Truth by now.

David Gordon, next month, has a story in which a very important variation on that problem is brought out. Some men are geniuses in business; some in knavery, and some—like Al Capone, for instance—combine the two talents. Some are geniuses at knavery, but not at business, and simply wind up proving that crime doesn't pay.

Then there are some who are geniuses in Science, but not in business . . . and they wind up proving that Science doesn't pay any better than crime.

Unless, of course, you do it, as Gordon suggests . . . "By Proxy."

THE EDITOR.



Courtesy of the Mount Wilson and Palomar Observatories

Venus photographed with the 200-inch telescope near inferior conjunction in blue light. Photographs taken in blue light show only a blank disk the same as the planet appears to the eye. Only photographs of Venus taken in ultraviolet light show markings.

NEEDED: ONE APHRODITE PROJECT

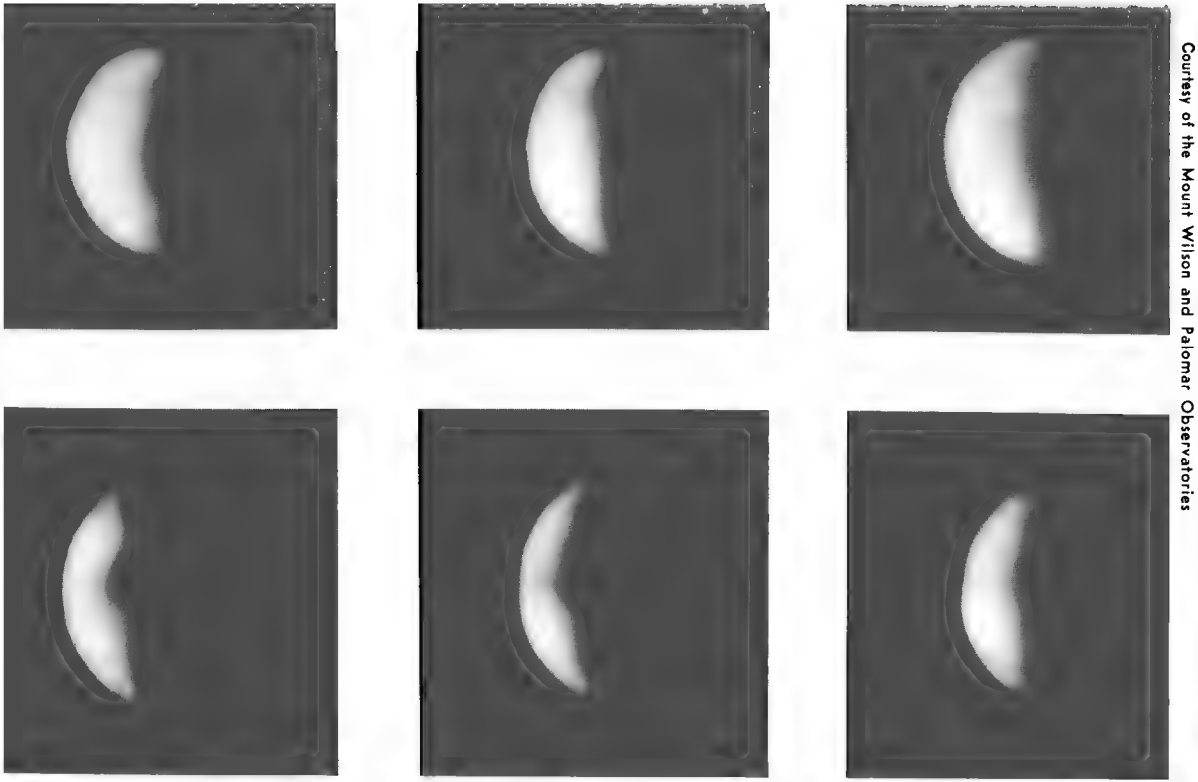
By R. S. Richardson

In the June 1949 issue of Astounding Science Fiction, Richardson published "The Aphrodite Project" concerning a space-probe rocket sent to Venus. Recently, the United States made a try in that direction. We still need, in actual fact, an Aphrodite Project! Venus, in many respects, is the least-known of all planets—yet the closest to Earth!

BACK in 1948 this writer under the name of Philip Latham produced an article — really fiction — for this magazine entitled "The Aphrodite Project," which purported to be a transcription of a government report describing how a rocket had been sent to Venus to endow that solitary planet with a satellite of its own. The article was written in the same style as the Smythe report on "Atomic Energy for Military Purposes" which had just come out. Apparently many people at that time were quite ready to believe it was possible to send a rocket to Venus, for I understand the editor received a flood of requests for the number of the government bulletin giving the details of the flight. (I believe most of the requests came from engineers and scientists who should have known better. The science-fiction fans were not so easily taken in.) The article also related how the Venusian cloud layer had parted giving astronomers a look at an enormous mountain on the surface.

Today the idea of sending a rocket probe to Venus is very much within the realm of reality. Undoubtedly such an instrument will add greatly to our knowledge of this planet. Until such a feat becomes possible, however, we will have to rest content with observations made from Earth in the usual way. Unfortunately, the clouds have never rolled away to give us so much as a single glimpse of the surface below. Thus of necessity all our information of Venus has been gained from without the cloud layer.

Still a little progress has been made. Some of the most important of the recent papers on Venus have been in Russian and hence have received little more than scant mention here. Translations of these papers are now available so that their results may be given in detail. They are mostly by Dr. N. A. Kosyrev of the Crimean



Courtesy of the Mount Wilson and Palomar Observatories

Photographs of Venus in ultraviolet light taken with the 100-inch telescope on Mount Wilson. Notice the dark bands which are most conspicuous at the center of the disk presumably near the equator. N. A. Kosyrev from his observations of the spectra of Venus believes that the dark bands are due to the presence of some polyatomic organic molecule.

Astrophysical Observatory, who startled the world about a year ago with his observation of what he called a "volcanic process" in the lunar crater Alphonsus. His observations of Venus are equally interesting if not so spectacular in nature.

I.

The first systematic series of photographs of Venus, that always showed markings on the disk, were taken by F. E. Ross at the Mount Wilson Observatory in 1927. Astronomers had had considerable luck in photographing Mars in light of different colors when the planet was close in 1924 and 1926, which led them to hope that the same technique could be applied successfully to Venus. Photographs of Mars in blue and violet light showed a blank disk except for the polar caps and possibly a bright cloud. But photographs in red light easily penetrated the atmosphere and clearly revealed the surface features. Fast red and infrared sensitive emulsions were just becoming available. Was it not possible that these would penetrate the atmosphere of Venus and show us the surface features that had been so long hidden from our view?

Unfortunately it didn't work out that way. The red and even the infrared photographs of Venus still showed only a blank disk. Photographs in blue light sometimes showed markings faintly. And photographs taken in ultraviolet light always showed markings. Thus Venus behaved in just the opposite way from Mars. The markings revealed in ultraviolet light were evidently cloud formation in the upper atmosphere for they had no permanency but changed from night to night. Due to phase only a portion of the disk was visible so that it was hard to tell much about the structure of the markings, but they appeared to be bands presumably parallel to the equator of the planet.

The origin of these bands has long been a puzzle. Ross explained them as an effect of contrasts. He assumed that the white surface we see consists of a uniform shell of light cirrus cloud overlying a dense yellowish atmosphere. This yellow atmosphere arises from dense clouds of dust stirred up by surface winds. Occasionally the white cloud cover is broken up, revealing the yellowish or reddish dust layers below. Ordinarily there will be hardly enough contrast between the high cirrus cloud layer and the yellow dust layer to be visible to the eye or to be photographed in visual light. But in ultraviolet light the yellow dust layer looks black while the white cloud layer is bright. Hence, there is considerable contrast between the two so that the markings stand out strongly. Ross advanced this explanation for the ultraviolet cloud bands quite tentatively without emphasizing it in any way. The assumption of a low-lying yellow dust layer was in accord with the fact that the color of the planet is slightly lemonish.

The reader may be surprised to

hear that Venus is not pure white. The yellowish color of Venus is strikingly shown if the planet is viewed in the daytime when terrestrial clouds are crossing the disk. Actual measures show that Venus is slightly redder than sunlight.

II.

Ross' explanation of the cloud bands given above has stood for thirty years, which will give the reader some idea of the degree of activity in this field. In the fall of 1953 Kosyrev decided to photograph the spectrum of Venus in the hope of finding some substance that might account for the ultraviolet markings. His procedure consisted in comparing the spectrum of the sun with the spectrum of Venus taken at the same altitude. Since the light of Venus is simply reflected sunlight the two should be exactly the same, unless there is some substance in the Venusian atmosphere to produce a difference.

I should say that on the face of it the project did not look very bright. The spectrum of Venus had already been examined pretty thoroughly without finding anything new except the carbon dioxide bands in the infrared. But Kosyrev seems to be a patient methodical type of investigator who does not become discouraged because others have looked before him and looked in vain. Owing to the multitude of absorption lines in the violet and ultraviolet part of the spectrum it is easy to overlook a broad shallow absorption band. Kosyrev also wanted to compare the energy distribution in the spectrum of Venus with that of the sun, something that had never been done before. There might be a general absorption throughout the spectrum that had gone unnoticed.

He found that for the red rays there is no difference between the sun and Venus. But going toward the blue a small very smoothly increasing absorption appears, which continues to about wave length 4540A. This absorption is attributed to dust particles of a yellow color. But beyond wave length 4540A a sharp increase in absorption occurs of a completely different nature, evidently produced by some molecule. In fact, he was able to detect the heads of two absorption bands in the violet at wave lengths 4372A and 4120A.

Kosyrev believes that his results show there is present in the atmosphere of Venus some unknown polyatomic molecule. The presence of this molecule provides a simple explanation of the dark bands on Ross ultraviolet photographs. The dark changing bands are simply places in the atmosphere where the unknown molecule exists in greater abundance. (Thus Kosyrev rejects Ross' explanation of contrast between cirrus and dust layer.) Evidently the density of the molecule depends rather critically upon the temperature, for the bands are confined to the assumed equator of the planet, while the polar regions are bright. The decrease in the con-

tent of the molecule with lower temperature probably means that in colder regions it goes into the condensed phase, like water vapor into rain. Thus the molecule may govern the weather on Venus just as water vapor largely determines the weather on Earth. At present the identity of this molecule is wholly unknown. It is one more thing that we don't know about the atmosphere of Venus.

Kozyrev has also made an investigation of the dark side of Venus to see if he could detect a glow like that in our night sky or evidence of the aurora. The glow in our night sky and the aurora can be traced back in the end to energy emitted by the sun. Therefore, it might be expected that Venus, which receives more than twice as much energy from the sun as Earth, should show considerably more luminosity in its atmosphere.

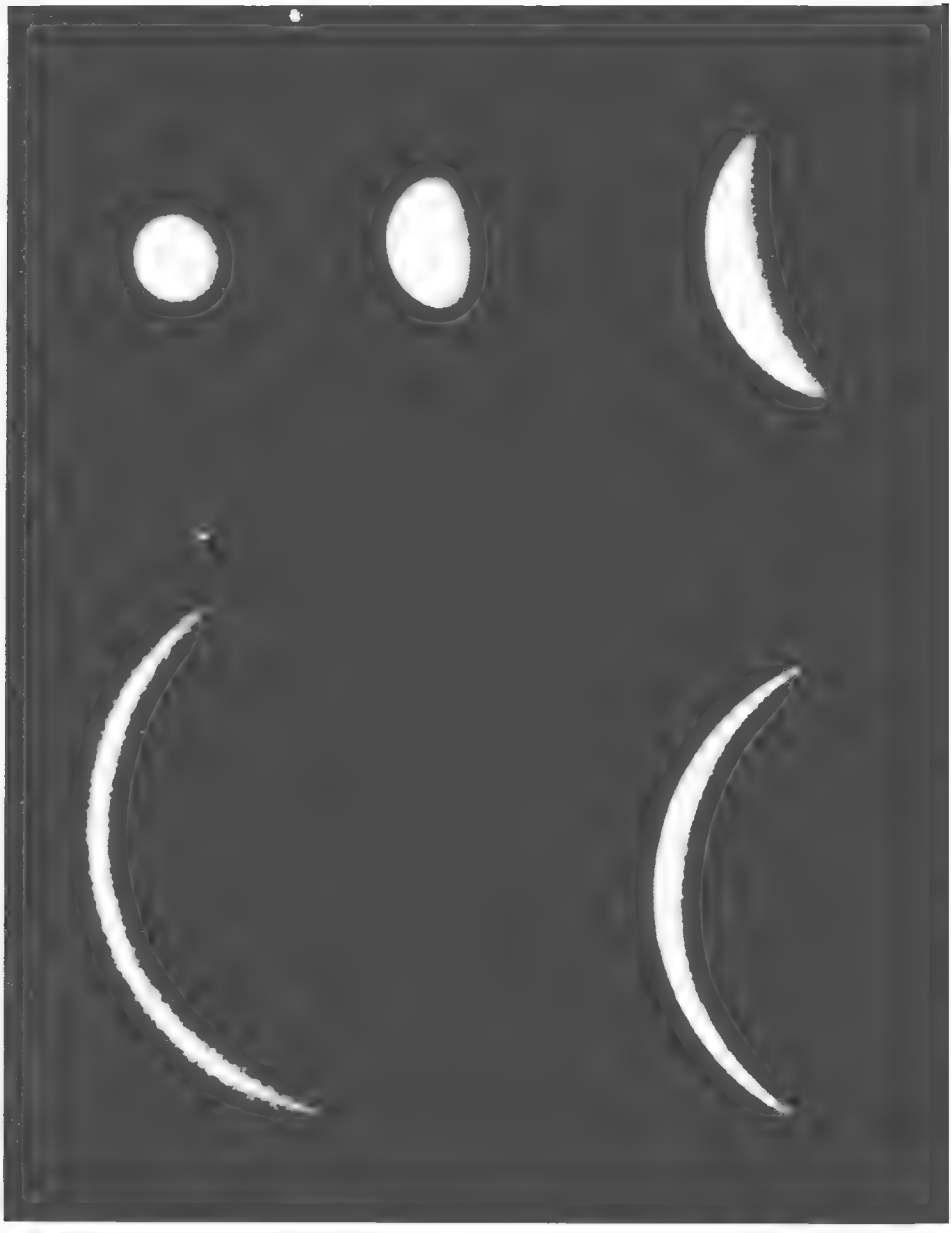
The reader may not be aware that our night sky has a glow. But exposures on the night sky that may run up to sixty hours and longer show the presence of faint rays that have been identified with light emitted by certain atoms and molecules in the upper atmosphere. Possibly these same rays may be emitted in the night sky of Venus. Of course, they would be exceedingly faint and require correspondingly long exposures to photograph.

Also, it is difficult to get light from the dark side of the disk only. Owing to atmospheric disturbances the image of the planet will shift around during the exposure, so that you are liable to get light from the bright illuminated part of the planet which you don't want, on top of the faint light from the dark side in which you are interested. This can be avoided to some extent by waiting until Venus is a narrow crescent so that there is plenty of space on the dark side of the image for photography. It also raises another source of error, for when Venus appears as a crescent it must be near the sun, which means that you are crowded for time. All your plates have to be taken either just before sunrise or after sunset.

Kosyrev apparently had his share of the troubles that beset all astronomers for clouds intervened to such an extent that he was able to secure only one photograph on a small scale that was properly exposed. His results are, therefore, based upon this one plate alone. From this single

Venus has been a confusing mystery since the beginning of modern astronomy. When Copernicus' heliocentric theory was introduced it was pointed out that Venus as an interior planet was sometimes very near and sometimes very far from Earth. How to explain then the fact that Venus always appeared to the eye about equally brilliant? This series of same-scale photographs show what the use of the telescope revealed. They'd forgotten phases.

Courtesy of the American Museum of Natural History



plate, however, he was able to draw several important conclusions.

The night sky of Venus contains many luminous rays due to the nitrogen molecule. These rays correspond to those found in our polar aurora, and *not* in the luminosity of the night sky. It is noteworthy that all the rays identified come from the molecules of N_2 and N_2+. No rays were found emitted by atoms such as the strong green and red rays of oxygen which are so prominent in the spectra of both the aurora and night sky. The luminosity of the night sky of Venus should be fairly bright despite the fact that it has no moon. Kosyrev calculates that the illumination of the night sky of Venus is five times less than that produced by the full moon. Which means that its brightness is about fifty times greater than the brightness of Earth's sky without the moon.

It is possible that the ash-colored light of Venus reported by astronomers of the last century may be connected with the luminosity of the night sky, and thus have a real existence instead of being dismissed as merely an optical illusion. The ash colored light was not observed every time Venus showed the crescent phase, but if the luminosity of the planet's sky is produced in the same way as our polar aurora we would expect considerable variations in brightness. For example, we might look for variations depending upon the number of spots on the sun. Kosyrev notes that it would take only a slight increase in brightness to enable an observer to detect the dark side of Venus.

III.

Thus two constitutents of the atmosphere of Venus have now been identified—nitrogen and carbon dioxide. Neither of these is of any help in identifying the nature of the white cloud layer. Our problem is to find a substance that is white and which also can exist on a planet in great abundance. We think immediately of condensed carbon dioxide—fine particles of dry ice. Here the trouble is with the temperature. It happens we know the temperature of the upper cloud layer on Venus quite accurately from radiometric measures made with the thermocouple. Three independent series of measures give a temperature of —40° C for Venus. For one atmosphere pressure the condensation temperature of carbon dioxide is —78° C, and for smaller pressures the temperature is proportionally lower. Thus the upper cloud layer is not nearly cold enough for carbon dioxide to freeze out.

Around the beginning of the century it was tacitly assumed that the white cloud layer of Venus consisted of water vapor like the clouds of Earth. They *looked* like water vapor. Therefore they *were* water vapor. But the astronomers of that day were not quite so naive. There were ways of testing the matter spectroscopically. Water vapor in the form of an invisible gas produces strong absorption lines in the spectrum some of

which can be observed visually. Do these absorption lines occur in the spectrum of Venus? The spectrum of Venus is identical with that of sunlight, except as it may be modified in passing through the atmosphere of Venus and the atmosphere of Earth. Now, if you look at the spectrum of Venus, you will find plenty of water-vapor lines there. But we *know* that the atmosphere of Earth is filled with water vapor. So how do we know whether any absorption is produced by water vapor in the atmosphere of Venus? To decide we must have some way of distinguishing between water-vapor lines produced in the atmospheres of the two planets.

The method originally used consisted of comparing the spectrum of Venus with the spectrum of the moon observed at the same altitude. The water-vapor lines in the spectrum of the moon must be produced entirely in Earth's atmosphere. Water-vapor lines in the spectrum of Venus are produced in the atmosphere of Earth and possibly also in the atmosphere of Venus. Therefore, the water-vapor lines in the spectrum of Venus might be more intense than those in the moon, owing to the additional absorption. In principle the method is very simple. In practice it is enormously difficult.

Remember that in the early days the comparison between the moon and a planet was made visually. You observed the spectrum of Venus when it was at a certain altitude. Then you waited maybe a couple of hours until the moon was at the same altitude. It is very important that the two be compared at the same altitude. If one object is lower in the sky, it will show stronger water-vapor lines since its light is coming through a longer path in Earth's atmosphere. But how can you remember how the spectrum of Venus looked two hours later?

You certainly can't remember it well enough to make a comparison that means anything. A man would go crazy trying to make such an observation. Yet some of the most eminent astronomers of this early period confidently claimed they had detected increased absorption due to oxygen and water vapor in the spectra of Venus, Mars, and Saturn! It is obvious now that such observations are worthless with the crude technique employed. Even when photography came into use so that the spectrum of the moon and a planet could be compared side by side it was hard to get a reliable answer.

Now it is fundamentally difficult to compare *intensities,* the brightness or darkness of one object relative to another. It is much easier to measure *positions.* In 1902 a method was suggested for detecting water-vapor and oxygen lines in the spectrum of a planet that depended upon measuring positions of spectrum lines rather than their intensities. No comparison with the moon was necessary. You simply took a photograph of the spectrum of Venus, for example, when the planet was moving rapidly toward or away from Earth. Owing to the Doppler effect any lines of

water vapor in the spectrum of Venus will be shifted slightly away from the position of the same lines produced in the atmosphere of Earth. The shift may be enough to bring the Venusian lines out in the open from behind the terrestrial lines. Or, if not enough to reveal them completely, it may be enough to produce an asymmetry in the lines from their normal positions.

The method was first suggested by Percival Lowell of the Lowell Observatory and later independently by W.W. Campbell of the Lick Observatory. When Campbell discovered Lowell had already published an article on the subject he indignantly denied ever having seen it. The two never were on good terms owing to squabbles over their scientific work and this incident did not serve to heal the breach between them.

The method of line displacements was first tried on Venus in 1923 by St. John and Nicholson at the Mount Wilson Observatory. They took spectra of Venus when it had a rapid motion both toward and away from Earth. At that time no emulsions were available sensitive to infrared light where the strongest water-vapor lines are located, so they had to use weaker lines of water vapor in the yellow. They were unable to detect any shift due to a possible Venusian component. A similar investigation was made in 1932 at Mount Wilson by Adams and Dunham this time in the infrared region, but again without result. A search for oxygen lines also came out negative.

So far as I am aware no one has ever repeated these measures. There is not much point in taking an observation over unless you think you can improve on it in some way. The method of line displacements encounters difficulties which are hard to appreciate without actually delving into the subject at firsthand. Owing to the great abundance of oxygen and water vapor in Earth's atmosphere the spectrum lines they produce are very strong and broad, and would easily obscure any weak Venusian component. Thus a weak Venusian line might well go undetected.

We must remember also that the spectroscope can detect water vapor only in the form of an invisible gas. It cannot detect water vapor in the form of a solid or liquid. But as we have seen the temperature of the upper cloud vapor on Venus is about —40° C. At this low temperature practically all the water present must be in the condensed form.

A similar case can be made out for the apparent absence of oxygen. The spectroscope can detect only the oxygen *molecule*. We know that above an altitude of about seventy miles in Earth's atmosphere practically all the oxygen molecules have broken up into atoms. May not the same process have occurred in the atmosphere of Venus? At the level we can see in the Venusian atmosphere perhaps all the oxygen is in the atomic form. Hence our inability to detect oxygen and water vapor in the atmosphere of Venus would not seem

to constitute conclusive proof of their absence.

IV.

If we accept the spectroscopic results and assume that the cloud layer on Venus is not due to water vapor, then we have to find some substance that is nearly white and which is likely to be present in great abundance. Quartz particles have been suggested, but as H. C. Urey points out, such a substance does not exist on Earth in large quantities, and no feasible process for its formation on Venus is evident. Also, polarization measurements on the clouds of Venus indicate that the particles are surprisingly uniform in size. Dust clouds formed from surface materials by a grinding process would be expected to have a large range in size.

The difficulty in finding a suitable cloud-forming substance for Venus has forced astronomers back to the water-vapor hypothesis, which has recently been revived by Menzel and Whipple of the Harvard College Observatories. They feel that the failure to detect water vapor in the atmosphere of Venus can hardly be regarded as much of an argument for its absence, since at the temperature prevailing above the cloud layer the amount of water present would only be one fortieth of that in the terrestrial atmosphere.

The puzzling feature is the great abundance of carbon dioxide on Venus over that on Earth. In the presence of water, carbon dioxide would react with silicates to form limestone or dolomite and sand. Thus in the course of the ages we would expect most of the carbon dioxide that was originally in the atmosphere to have become "fossilized" in the surface rocks, so that only a small amount would be left in the atmosphere. The difficulty may be explained away if it is assumed that the *entire surface* of Venus is covered by water. There would then be no surface rocks available to react with the carbon dioxide. Fossilization of carbon dioxide from the atmosphere would stop very quickly after a thin buffer layer of carbonates had formed from the silicates of the ocean bed.

An objection to the water-vapor hypothesis is the yellowish tint of Venus. This is a rather serious objection as water clouds viewed from above are white. Urey remarks, however, that if the atmosphere of Venus contains little or no oxygen, then carbon compounds would almost certainly be present which would contaminate the clouds and probably produce absorption of blue and violet light. Molecules which might be expected in the Venusian atmosphere in the absence of oxygen are CN, CH, CH+, C_2, N_2+, OH, and OH+, besides many carbon compounds. He notes that the two bands found by Kosyrev in the violet lie close to certain bands of CO+. Taking all the possibilities into account Urey concludes that the clouds of Venus most likely consist of water vapor with some carbon compounds present, and that absorption by CO_2

and CO probably contributes to the yellowish color.

V.

From the point of view of inhabitability the temperature at the surface of Venus is naturally of the greatest interest, but until recently there seemed to be no way of getting any information on this subject. About all we had to go on were some calculations based on rather shaky assumptions made by Wildt in 1940, who deduced a maximum temperature of 135° C for the surface of Venus. In 1958 the United States Naval Research Laboratory released some results of thermal radiation measures at 3.15 cm made on Venus with their radio telescope. They get very high temperatures ranging from 287° C to 347° C. The radio researchers hesitate to state where this radiation comes from, except that it must be a different level on the planet from those previously studied with the thermocouple. They surmise that "at least part of the 3.15-cm radiation may be emitted at the surface of the planet." If this excessively high temperature actually refers to the surface, it would seem to raise severe difficulties for the universal ocean hypothesis.

The Russians have disregarded the difficulties of atmosphere and temperature and have gone so far as to hazard a guess at the color of the vegetation on Venus. This is the result of experiments and observations carried out on the Pamir plateau near the Arctic Circle. The Pamir plateau would seem to be a poor place to find out anything about plant life on Venus, for the climate is exceedingly cold and dry, closely resembling that on Mars. But there are also hot springs in the region where observations can be made on plants growing under what is presumed to be an approximation to Venusian conditions.

As already reported in "Mars: A Summing Up," the Russians have found that plants reflect light in different ways depending upon the climate. In temperate latitudes plants reflect infrared light strongly and are fairly good reflectors of orange and yellow, and especially green rays. But in extremely cold regions the plants were found to absorb most of the sunlight falling upon them, so that they reflect only weakly in the infrared. They are of a "colder" color than plants in temperate climates, being darker and bluish in tint. This agrees with the tint of the dark areas on Mars which do not brighten up when photographed in infrared light as we would expect if they reflect like terrestrial vegetation.

When Mars was close in 1956 and 1958 the dark regions appeared distinctly bluish in color. The Russians explain this as a means of self-protection. The plants on Mars absorb nearly all the sunlight that falls upon them in an effort to keep warm. Only the blue and violet rays are reflected.

On a planet like Venus we should

expect the plants to behave in just the opposite way from those on Mars. They would try to get rid of as much heat as possible by reflecting the infrared rays as well as the visible light in the red, orange, and yellow. The Venusian plants should have a "warm" color. The Russians believe they have got some evidence to this effect from observations of algae growing in hot springs where the temperature reaches 71° C. In fact, the orange-red algae growing in the water and visible from a distance are the chief indications of the presence of a hot spring.

G. A. Tikhov, writing about astrobotany in connection with Venus, remarks that "some observations made by astronomers of the Kharkov Observatory show that the color of those places in the clouds surrounding the planet on which the Sun rays reflected by its surface fall indicates a certain redundancy of red and yellow rays. Could this be due to the influence of the light dispersed by the planet's vegetation?" While it could be that the clouds parted momentarily to reveal a bed of marigolds, in our present state of ignorance such a hypothesis seems rather strained.

VI.

The rotation period of Venus is still wholly unknown. It is curious to think that we have a reliable value for the rotation period of Pluto—6.39 days—which simply looks like a star even in the largest telescope, while the best we can do is to set some kind of limit on the rotation period of the planet that comes nearest Earth. The various rotation periods derived from the markings give such contradictory results that it is useless to consider them. The fact that radiation measures on the day and night side of the planet give essentially the same temperature indicate a moderately rapid rotation period. This would seem to be a natural problem for the spectroscope. We take a spectrum of the planet. On the edge of the planet approaching Earth the Doppler effect shifts the spectrum lines slightly toward the violet. On the side of the planet receding from Earth the spectrum lines are shifted slightly toward the red. By measuring the amount of the shift it is possible to determine how fast the planet is rotating and in what direction.

The most recent measures on the rotation of Venus were made by the writer in 1958. The straight mean of the measures gave a rotation period of fourteen days in a retrograde direction. Little weight can be attached to this result, however, as the probable error of the measures was nearly as big as the quantity measured. Similar results were obtained by V. M. Slipher at the Lowell Observatory in 1903 and by St. John and Nicholson at Mount Wilson in 1924. It is interesting to note that the three of us who have worked on this problem have gotten a retrograde direction of rotation for Venus, which we have all been reluctant to accept. By a retrograde direction of rotation

we mean that looking down on the north pole of the planet the direction of rotation would appear to be clockwise, contrary to the direction of rotation of Earth and Mars. Evidently Venus is rotating so slowly that the Doppler shift of the spectrum lines is too small to be measurable.

Recently J. D. Kraus of the Ohio State University recorded radio signals of an impulsive nature from Venus recurring about every thirteen days. These radio signals show a distribution pattern that is repeated from 1.6 to 1.85 hours earlier on successive days. He believes that the thirteen-day interval is not the true rotation period, as it seemed to him unlikely the activity would be repeated by a pattern advancing a fixed amount each day. Rather he interprets the thirteen-day interval as representing the beat frequency between the rotation periods of Earth and Venus, and puts the probable value of the rotation period as twenty-two hours seventeen minutes. The radio observations give no information on the direction of rotation.

Such a short period seems impossible to reconcile with the spectroscopic results. Also, if the rotation period were only twenty-two hours we would expect the disk of Venus to be sensibly oblate, but no evidence for polar flattening was ever found from numerous measures made when Venus was in transit across the disk of the sun. It seems more likely that the thirteen-day interval is the right one, and that the daily advance arises from some local disturbance in the planet's atmosphere.

In connection with the rotation of Venus I would like to broach a problem to the readers of this magazine who have more ingenuity than myself. It never occurred to me until I came to write this article.

Suppose for the sake of argument that a party has landed on Venus and found living conditions fairly favorable. One of the objectives of the party is to measure the rotation period of the planet. We will suppose further that they are fully equipped with instruments, and can travel swiftly over the surface. How are they going to accomplish their objectives?

If they could see the sky, the easiest method would be to set up a telescope in the plane of the meridian and time two successive passages of a star through the field of view. Of course, any observations of the heavenly bodies is out of the question so that they have to resort to other methods.

A method that immediately suggests itself is the Foucault pendulum experiment. If a pendulum is once set swinging, it will continue to vibrate in the same plane as long as it is not disturbed by external forces acting upon it. Thus, if a pendulum were set swinging over the pole of a planet, it would appear to swing around through a complete revolution in a time equal to the sidereal period of rotation of the planet. What actually happens, of course, is

that the pendulum continues to swing in the same direction while the planet rotates beneath it. As we journey away from the pole the period of rotation of the pendulum would increase until at the equator it would show no rotation at all. The law of change is that the period of rotation of the pendulum equals the sidereal period divided by the sine of the latitude. Thus at the pole the sine of the latitude is one so that that period of rotation is just equal to the sidereal period. At the equator the sine of the latitude becomes zero so that the period of rotation is infinitely long. Hence, if we observe the period of the pendulum and then multiply by the sine of the latitude, we can get the true rotation period immediately.

But how are we going to get our latitude on Venus? On Mars the latitude could be determined without trouble from measuring the altitude of a star near the pole of the heavens. We measure the altitude of the star when it is above the pole. We measure its altitude half a day later when it is below the pole. The mean of the two altitudes is equal to the latitude. But of course this is out of the question on Venus.

To determine the rotation period of Venus the explorers would be forced to perform a series of pendulum experiments over the planet, trying one place after another, until finally one was located that gave the shortest rotation period. Then they would know they were at the pole. Knowing the position of the pole and the diameter of Venus the latitude of any point could be determined by surveying. But there would seem to be no way of fixing fundamental points of reference over the surface.

This also brings up the practical difficulty of how explorers are going to travel any considerable distance over the surface of Venus and find their way back home without the stars to guide them? How can they make maps of Venus? How can boundary lines be fixed between countries with sufficient accuracy to prevent endless squabbles? That pesky cloud layer can cause all kinds of trouble besides the obvious one of cutting off the light of the sun.

VII.

The fact that we are still ignorant of conditions on the surface of Venus would seem to be both a hindrance and a help from a purely fictional point of view. When an author puts his characters on Mars he immediately sets them in a definite frame work which limits their activities, and influences their manners, morals, and mental and physical activities. This may be somewhat of a handicap trying to stay within these limitations. He certainly cannot have a fire or a flood on Mars. It is doubtful if he is justified in assuming the existence of any high form of life without oxygen. On the other hand, the very existence of these limitations is helpful in suggesting situations and in guiding and mo-

tivating the characters.

But, as is evident from what has gone before, on Venus a writer is subject to practically no limitations whatever. He can make it a steaming jungle filled with brilliantly colored plants. He can make it an endless watery waste. He can make it a dust-bowl planet. It is like living in a dream. Nothing that happens in a dream seems unusual because the whole dream is unusual. You have too much freedom.

The only point on which everyone seems agreed about Venus is that it is dim at the surface, According to Kosyrev there is no convection in the lower atmosphere of Venus. The atmosphere is stable at the surface where only a faint twilight prevails. All the effects of weather appear in the upper layers of the atmosphere where the sunlight penetrates. Thus we have still another picture of Venus. A dim futile world like the Garden of Proserpine where no breath of wind stirs and nothing ever happens through the long Venusian twilight.

THE END

Accepting that the number "eleventy twelve" is a legitimate statement in a certain number system, what is the minimum value it could have in the decimal system?

Answer: (Don't read until you've had the fun of trying to figure it out.)

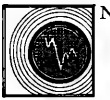
"Eleventy twelve" implies a number-system in which both 11 and 12 are represented by single symbols—say # is the symbol for the quantity 11, and @ the symbol for 12. Then the system must include another symbol, let's say &, for 10. The system must, then, count 1, 2, 3, 4, 5, 6, 7, 8, 9, &, #, @ . . . *at least*. At least, because we have no evidence that this is not a vigesimal system, with 20 symbols. And it is *not* a duodecimal system, because in a duodecimal system, 12 is represented by 10, not by a single symbol. Then in the system here encountered, 10 may stand for anything greater than 12, but the minimum possibly is 13.

"Eleventy twelve" would be, in symbols, #@, which means "eleven times the base quantity, plus twelve units." The minimum possible base is 13, so the minimum possible decimal value of "eleventy twelve" would be $11 \times 13 + 12$, which is 155.

THE FORMATION OF THE ELEMENTS

By ALASTAIR CAMERON

Whether you start with the ylem-explosion theory, or the steady-state theory of the Universe's origin, somehow you have to get from hydrogen to the heavy elements. Currently, it looks as though stellar cores were the element-makers.



ONE of the time-honored principles used by writers of *science* fiction—as distinct from science *fiction*—is the assumption of a physical situation different from any with which we are accustomed, in some well-stated way. A planet can be hotter, or colder, or wetter, or drier, or something of the sort. Sometimes it has an abnormal composition of chemical elements. The writer tries to work out the physical, chemical, and biological consequences of his assumed abnor-

mality, and then he looks for a story gimmick which can exploit them.

I have no objection to planets being hotter, colder, wetter, or drier if they have an appropriate mass and are placed a suitable distance from a star of reasonable type. However, I am beginning to doubt that most of the chemical peculiarities assumed in various stories can occur.

The theory of the origin of the elements is becoming developed in sufficient detail that one can predict the abundances of most elements in our galaxy to within about a factor two, and it seems that these abundances are rather uniformly spread out through the galaxy. So please don't assume any more that some extensive region of space is lacking some critical elements. There are still some possibilities open that certain regions of space are greatly enriched in some of the elements, particularly most of the elements heavier than molybdenum. A lot of good stories can be based on that assumption. I will suggest other possibilities at the end of the article.

Just a few years ago, we had only the crudest idea of the composition of our galaxy. Astronomers examined the spectra of various kinds of stars, and were pleased to find that the stars contained the same general composition of elements as did our sun, and the sun had roughly the same composition as did the Earth and meteorites, allowing for the fact that volatile gases have escaped from the earth and meteorites. Most of these abundance determinations were uncertain by a factor of ten or more! Scientists usually make the simplest assumption consistent with known facts, and in this case the obvious simplest assumption was that the abundances of the elements were uniformly constant throughout our galaxy and our universe.

However, one could not just assume that these elements in their observed relative abundances were an inherent property of matter and that they had existed for an indefinite time into the past. Certain of the elements, such as potassium, thorium, and uranium, are naturally radioactive, and if they had existed for an infinite length of time there would have to be an infinite abundance of their decay products! Of course, there is only a finite abundance of these decay products, and from this finite abundance one can calculate that these radioactive elements have not existed for longer than about six billion years.

This posed quite a challenge to the cosmologists. Generally speaking, there were two schools of thought in cosmology. One held that the universe was concentrated in a superdense state about six billion years ago, and that it exploded; its gases condensed into galaxies. These gases were supposed to be mainly composed of neutrons, and during the explosion it was believed that the neutrons were captured by the hydrogen atoms to build up all the heavy elements. The main difficul-

ty with this theory was that no one could find appropriate nuclear reactions by which the neutrons could build up any heavier elements than helium!

According to the second school of thought the universe has an infinite age, but the galaxies within it are continually running away from one another. This creates a tension within the fabric of space-time which is relieved by the creation of new matter in the form of hydrogen atoms. When enough of this new matter is formed, it condenses into galaxies, the galaxies condense into stars, and nuclear reactions in the stars form the elements with the relative abundances which we see and eject these elements into space, where they can be incorporated in new stars and in planets.

Let me point out here that while we now definitely believe that the elements are formed in stars as the cosmologists of the second school demanded, this does not give any basis of preference for this "continuous creation" school of thought. The first school of "big bang" enthusiasts is also quite content to have the elements made in this way.

About five years ago, the methods of determining element abundances from stellar spectra became more precise, and it was shown that our galaxy did not have a uniform abundance distribution of the elements. Stars were divided into two classes: Population I consisted of those stars concentrated toward the plane of the galaxy in the region where there are high concentrations of interstellar gas and dust, and Population II consisted of a much more spherical distribution of stars which formed a far-flung halo around the galaxy in regions nearly clear of gas and dust. The Population II stars were all very old, most of them about six billion years old, and most of them had distinctly smaller abundances of all elements relative to hydrogen than did our sun. The Population I stars included the sun, 4.5 billion years old, and the entire range of stars which are younger than the sun and are still being formed out of the gas and dust. The youngest stars seemed to be somewhat enriched in heavy elements relative to the sun.

From these observations, it was very natural to form a theory of element formation in stars. It was supposed that the galaxy was originally a large nearly spherical mass of hydrogen gas in space. Some stars formed out of this gas, and during the course of their evolution*, nuclear reactions produced the various elements, which were ejected back into the interstellar medium when the stars reached the ends of their evolutionary paths. These new elements were incorporated in new stars forming out of the interstellar medium, and were further processed by nuclear reactions. Gradually most of the mass of the galaxy became

*See "The Evolution of the Stars", by Alastair Cameron, Astounding Science Fiction, September, 1958.

condensed into long-lived stars of smaller mass, and the remaining gas collapsed into roughly the form of a pancake lying in the central plane of the galaxy. That is why the formation of young stars has taken place close to this central plane. As time went on, it was supposed that the interstellar gas became enriched in heavy elements at a roughly constant rate. These ideas received much support from the fact that certain types of stars were observed to have very abnormal abundances of the elements, being greatly enriched in the heaviest elements, showing that element formation processes are still taking place. These stars are in advanced stages of evolution.

However, within the last year this picture has undergone another major modification. A few old stars have been discovered which are nearly pure hydrogen; the abundances of other elements are decreased relative to those in the sun by a factor lying between 100 and 1000. At the same time, better analyses have shown that the young stars have very nearly the same composition as the sun. This makes it seem that most of the element formation took place early in the history of the galaxy.

At the present time only about two per cent of the mass of the galaxy exists in the form of interstellar gas and dust. Thus when the galaxy first started to condense, the rate of star formation may have been about fifty times its present rate. The stellar activity associated with short-lived massive stars would have been correspondingly increased, and this suggests that the element formation may have been mainly associated with these massive stars. In recent months, I have been investigating the nuclear reactions which take place when such massive stars undergo supernova explosions. As a result of this, it appears that these stars have been responsible for making most of the elements in the galaxy in the relative proportions which we observe in the solar system. Since most of these very massive stars formed, evolved, and exploded when the galaxy was young and mostly composed of gas, the bulk of the element formation took place in these early stages of galactic development. Nevertheless, some very massive stars continue to form from the interstellar gases today, and hence element formation continues to occur at a much slower rate.

I will now describe in some detail what I believe to be the life history of a very massive star composed initially of nearly pure hydrogen. The astrophysicists have not yet investigated the evolution of such stars, and so it is necessary to follow the life history of this star from the point of view of nuclear physics. For convenience, and for reasons which will become evident in due course, I am going to call this star "Humpty Dumpty".

When Humpty Dumpty first con-

denses out of the interstellar medium, he gets very hot inside. This occurs because matter which falls into a gravitational field releases potential energy; water flowing over a waterfall can turn turbines and generate electricity. However, stars are not as sophisticated as hydroelectric generating stations, so when the various parts of a star fall together in their mutual gravitational field, energy is released in its ultimate disorganized form, which is pure heat. When the central parts of Humpty Dumpty gets hot enough—about 100,000,000 degrees Absolute—the conversion of pure hydrogen to helium takes place by thermonuclear reactions.

Readers who have been brought up on the idea that carbon and nitrogen nuclei must act as catalysts for this conversion may be surprised to learn that such catalysts are not in fact necessary. Certain other types of reactions, called the proton-proton chains of reactions, do the job so well that even in our sun the carbon-nitrogen cycle of reactions is only responsible for about two percent of the energy generation. These chains of reactions will be entirely responsible for the hydrogen to helium conversion in Humpty Dumpty, who is composed initially of nearly pure hydrogen.

The basic reaction in the proton-proton chains is the proton-proton reaction itself, which may be written:

$$H^1 + H^1 \rightarrow D^2 + e^+ + \nu.$$

Here two hydrogen atoms collide and in a very rare event they coalesce to form a deuterium atom—heavy hydrogen of atomic weight two—plus a positive electron and a neutral, very penetrating particle called a neutrino. The deuterium atom reacts very quickly with another hydrogen atom to form an atom of helium-3, which is a light form of normal helium:

$$D^2 + H^1 \rightarrow He^3 + \gamma\text{-rays}.$$

These are the only reactions which can take place for a while. However, after some of the hydrogen has been converted to form an appreciable amount of helium-3, the helium-3 atoms can react among themselves to form the more normal form helium-4:

$$He^3 + He^3 \rightarrow He^4 + 2H^1.$$

Things go on in this way for some time until an appreciable abundance of helium-4 has been established. Then a more powerful reaction takes over:

$$He^3 + He^4 \rightarrow Be + \gamma\text{-rays}.$$

Here a nucleus of beryllium-7 is formed. This is normally unstable when it is formed on the earth; it decays with a half-life of fifty-three days by capturing one of its orbital electrons:

$$Be^7 + e^- \rightarrow Li^7 + \nu.$$

This forms lithium-7 and a neutrino.

In Humpty Dumpty, these orbital electrons are all stripped away by the extreme heat, but the same reaction can take place with the free electrons surrounding the beryllium-7 nucleus. Hydrogen very quickly destroys the lithium-7, forming helium-4:

$$Li^7 + H^1 \rightarrow 2He^4.$$

However, even before this electron capture can destroy the beryllium-7 atoms, they are more likely to be destroyed by thermonuclear reactions with hydrogen, forming boron-8 atoms:

$$Be^7 + H^1 \rightarrow B^8 + \gamma\text{-rays}.$$

The boron-8 atoms emit positive electrons and neutrinos, transforming into beryllium-8, which immediately decays into two helium-4 atoms:

$$B^8 \rightarrow Be^8 + e^+ + \nu.$$
$$Be^8 \rightarrow 2He^4.$$

These reactions thus convert hydrogen to helium through a variety of possible chains of reactions.

After a large fraction of the mass at the center of the star is converted into helium, some additional contraction and heating will take place. Soon the helium becomes transformed into carbon-12 by the so-called "three-alpha" process:

$$^3He^4 \rightarrow C^{12} + \gamma\text{-rays}.$$

This involves a triple collision of three helium-4 atoms. There is a certain energy at which the three atoms can resonate together and emit γ-rays to form the C^{12} atom. During the course of time, the central portions of Humpty Dumpty are transformed into carbon by this mechanism.

Still later the carbon will also undergo nuclear reactions and be transformed into still heavier atoms. This occurs when the central temperature becomes about 600,000,000 degrees Absolute. The reactions which now occur are rather complicated but they have some interesting consequences. The following is a simplified account of what happens. Two reactions occur when C^{12} collides with itself:

$$C^{12} + C^{12} \rightarrow H^1 + Na^{23},$$
$$C^{12} + C^{12} \rightarrow He^4 + Ne^{20}.$$

These reactions produce hydrogen, helium, sodium-23, and neon-20. The hydrogen is immediately absorbed by more of the carbon to form a heavy isotope of carbon:

$$C^{12} + H^1 \rightarrow N^{13} + \gamma\text{-rays},$$
$$N^{13} \rightarrow C^{13} + e^+ + \nu.$$

The C^{13} now reacts with helium to form neutrons:

$$C^{13} + He^4 \rightarrow O^{16} + n$$

The neutrons are slowed down and then captured by the surrounding atoms.

Generally speaking, the heavier atoms have a greater tendency to absorb neutrons than the lighter atoms. This means that the sodium-23 and the magnesium-24 which are produced will capture most of the neutrons. We get a series of reactions which starts in this way:

$$
\begin{aligned}
&Na^{23} + n \rightarrow Na^{24} + \varphi\text{-rays},\\
&Na^{24} \rightarrow Mg^{24} + e^- + \nu,\\
&Mg^{24} + n \rightarrow Mg^{25} + \varphi\text{-rays},\\
&Mg^{24} + n \rightarrow Mg^{25} + \varphi\text{-rays},\\
&Mg^{25} + n \rightarrow Mg^{26} + \varphi\text{-rays},\\
&Mg^{26} + n \rightarrow Mg^{27} + \varphi\text{-rays},\\
&Mg^{27} \rightarrow Al^{27} + e^- + \nu,\\
&\qquad\qquad \text{et cetera.}
\end{aligned}
$$

This series of reactions involves a succession of neutron captures which produce heavier isotopes of the elements involved. Eventually, a neutron capture product is reached which decays to another element by emitting a negative electron and another neutral, very penetrating particle called an antineutrino and printed as ν.

As neutron capture goes on, all the heavy elements up to bismuth are formed. We must note, however, that not all stable isotopes of all these elements are formed. There is usually a pause of several years between the time that any one nucleus captures a neutron and the time it captures the next neutron. During this time most of the radioactive isotopes of the elements can decay to the next element. This often prevents the formation of the heaviest isotopes of an element by this mechanism. Also, many elements contain light isotopes which do not get formed by this neutron capture process. These "bypassed" isotopes have much smaller abundances than those which can be formed by neutron capture.

When neutron capture goes beyond bismuth, products are reached which decay by emitting helium nuclei. One then gets a cycle which turns neutrons into helium atoms:

$$
\begin{aligned}
&Pb^{206} + n \rightarrow Pb^{207} + \varphi\text{-rays},\\
&Pb^{207} + n \rightarrow Pb^{208} + \varphi\text{-rays},\\
&Pb^{208} + n \rightarrow Pb^{209} + \varphi\text{-rays},\\
&Pb^{209} \rightarrow Bi^{209} + e^- + \nu,\\
&Bi^{209} + n \rightarrow Bi^{210} + \varphi\text{-rays},\\
&Bi^{210} \rightarrow Tl^{206} + He^4,\\
&Tl^{206} \rightarrow Pb^{206} + e^- + \nu,
\end{aligned}
$$

Because of this cycle, large abundances of lead and bismuth are made in the neutron capture process. These abundances are small, however, in comparison to the abundances of lighter nuclei near magnesium which are made by the carbon reactions.

As Humpty Dumpty's central temperature and density get higher and higher, still more complicated sets of nuclear reactions take place. In general, the temperature becomes high enough for very energetic φ-rays to exist in the radiation field in the stellar interior. These φ-rays have a high enough energy to knock neutrons, protons, and helium atoms out of the nuclei in the interior. These are immediately captured by other nuclei. In this way a large number of nuclear rearrangements takes place.

By the time the temperature has reached 2,000,000,000 degrees Absolute, the nuclear rearrangement have converted most of the interior into the isotope iron-56 and neighboring isotopes. This has released all the nuclear energy which can be released, for it requires an input of energy to combine iron nuclei into heavier ones! Humpty Dumpty can no longer obtain an energy supply from the material at his center, but must rely on the material in his outer layers, which still contains nuclear fuel.

As time passes the material in the center of the star gets denser and denser. The electrons become degenerate. This means that as the electrons are squeezed closer and closer together, their velocities must get larger and larger. This in turn follows from Heisenberg's uncertainty principle, which states roughly that we cannot know accurately both the position and the velocity of a participle. Thus if we squeeze particles very close together, there is very little uncertainty in their position, so there must be a large uncertainty in their velocities, which will become very large.

These degenerate electrons resemble in many ways the electrons in a piece of metal. Among other things, they conduct heat very well, very much better than the metal does, as a matter of fact. Thus despite the fact that the continued contraction of Humpty Dumpty's central regions releases a lot of heat, the heat is rapidly conducted away, and hence the temperature does not rise to much more than two billion degrees.

Let us now take stock of the situation. Humpty Dumpty's central temperature is about two billion degrees, and his surface temperature is much less than one million degrees. He still has unconsumed hydrogen on the surface. As we go inwards and the central temperature rises, we will come across successive layers in which the hydrogen has been converted into helium, then the helium has been changed to carbon, the carbon has in turn been transformed into intermediate nuclei such as magnesium—with a small amount of heavy element formation by neutron capture—and finally the intermediate nuclei have been rearranged to form the iron in the central core. The boundaries of these layers of different composition are progressively enclosing a larger and larger fraction of Humpty Dumpty's mass as he obtains energy from the nuclear reactions, and radiates it into space. The center becomes denser and more degenerate.

Because Humpty Dumpty is a very massive star, his life history up to this point has occupied only a few million years. However, he is headed for a major catastrophe, and once his central density has reached about 100 billion grams per cubic centimeter, his future history is measured in minutes.

At such a high central density the electron velocities become truly enor-

mous, and the electrons are squeezed into the nuclei, where they transform protons into neutrons. This is a progressive process; more and more of the nuclear protons are converted into neutrons, until the nuclei can no longer hold on to all their neutrons, some of which must be emitted. Most of the pressure at the center of the star is produced by the high velocities of the electrons, and when the electrons are removed the outer layers can no longer be supported in the manner to which they have become accustomed. The contraction of the star thus becomes accelerated, and rapidly the nuclei at the center become converted mostly into neutrons. Toward the end, there is a full-scale implosion at the center of the star.

And so Humpty Dumpty has his great fall. His center has collapsed, and his outer layers also undergo a great implosion. These outer layers do not undergo an indefinite collapse however, because a great deal of energy is needed in order to squeeze the material to a high density. The only energy available is that in the gravitational field, and the material can only be compressed to a certain limiting density before its fall must stop. This limiting density—and a corresponding limiting temperature —depend on the temperature and density before the collapse. Thus various parts of the envelope are heated to varying temperatures, usually a few billion degrees.

When one examines the situation in detail, it turns out that the hydrogen and helium layers are not heated and compressed enough for very many nuclear reactions to take place before the layers are blown away again. The situation is different in the layers composed of carbon and intermediate atoms. These are heated into the range of two to three billion degrees. In the lower part of this temperature range, there is a series of nuclear reactions which form oxygen and magnesium nuclei. The heavy nuclei formed by neutron capture are not affected in this region. However, in the upper portion of the temperature range the products formed are isotopes of elements lying in the range silicon to calcium. The heavy nuclei which were formed by neutron capture now have a few neutrons knocked out in collisions with high energy γ-rays, and this forms the "bypassed" heavy nuclei which we were not able to form by neutron capture at all.

The energy released in these nuclear transformations is sufficient to blow the outer layers away from the star with high speeds. We then see it flare up in a supernova explosion. The former iron core with its neutron center is exposed when the outer layers have been ejected.

This iron core has been heated suddenly to more than ten billion degrees during the collapse of Humpty Dumpty's central regions. However, its material remains a very efficient conductor of heat. When the edge of

the core is exposed, the hot material there can be evaporated into space. This is why there is such a lot of iron in the sun and the solar system. Heat is rapidly conducted from the center of the star to keep the edge of the core very hot and to allow rather a lot of material to be evaporated.

After most of the unconverted iron has been evaporated, a transition region is exposed in which most of the nuclei have been converted to neutrons. This, too, can be evaporated, and when it is, the nuclei rapidly capture the neutrons which surround them. Thus we have formed the heavy isotopes of the elements which could not be formed by neutron capture on the very much slower time scale involved in the orderly evolution of the star. This neutron capture goes well beyond bismuth and forms heavy radioactive elements, including thorium and uranium.

Probably some of the neutron core can be evaporated, too. But this neutron gas has been heated so much that all the nuclei in it have been smashed to individual neutrons and protons, and most of the protons have been squeezed together with electrons to form more neutrons. When this gas is evaporated, the protons capture neutrons to form deuterium:

$$H^1 + n \rightarrow D^2 + \gamma\text{-rays.}$$

The deuterium captures further neutrons to form tritium:

$$D^2 + n \rightarrow T^3 + \gamma\text{-rays.}$$

All these are isotopes of hydrogen. No further neutron capture can occur, but the deuterium and tritium quickly react to form helium-4:

$$T^3 + D^2 \rightarrow He^4 + n.$$

Now the isotope helium-5 cannot exist; it loses its last neutron immediately. Thus no nuclei heavier than helium-4 can be formed from the neutron gas. The neutrons decay to form protons, and these eventually exhaust the neutrons:

$$n \rightarrow H^1 + e^- + \nu.$$

Some part of the neutron gas is left behind, but it is a very insignificant stellar remnant compared to the original glory which was Humpty Dumpty. All the king's horses and all the king's men cannot put Humpty Dumpty together again.

Hence Humpty Dumpty's explosion has thrown off into space all the elements from which the solar system is composed and in about the right relative proportions. Even the light elements lithium, beryllium, and boron may be made by charged particle reactions resulting from energetic charged particles accelerated by magnetic fields in Humpty Dumpty's expanding gases. The other stars like Humpty Dumpty have done very nearly the same thing, and hence all throughout the mass of the galaxy these elements were quickly produced in the familiar proportions. This is why we expect a basic uniform composition of the elements throughout the galaxy. Those plan-

etary systems formed early in the history of the galaxy may have had less of the elements heavier than hydrogen, but they were present in solar system proportions.

At this point, the science-fiction writer says, "Ah, yes! But how about the stars of smaller mass? When they evolve, may they not put out a very different abundance distribution which will give me some interesting story possibilities?"

I think he has a very good point, and he is right. These are the possibilities—see what you can do with them:

One of the most obvious ways in which a star of somewhat smaller mass can produce a difference in the products ejected is to form a smaller inner neutron core which is not heated so much that the nuclei in it are completely broken down into neutrons and protons. In this case, the ejected neutron gas captures neutrons and builds up large quantities of all the elements from molybdenum on upwards, although elements like barium, lanthanum, praesodymium, cerium, neodymium, thallium, lead, and bismuth are not produced with such large abundances as the other elements. Large quantities of the isotope californium-254 are produced by this process. This has the distinction of decaying primarily by fissioning rather than by emitting a light particle, and consequently it releases far more energy than any light-particle emitter. Its half-life is fifty-six days, which is far longer than that of any other nucleus decaying predominately by fission.

Now it so happens that there are two kinds of supernovas. In Type I the light outburst goes through a maximum and rapidly declines, and then the light output steadies and dies away thereafter with a half-life which is the same as that of californium-254. It has been suggested that the fission energy released by californium-254 is responsible for the latter part of this light curve. Type II supernovas do not show this slow final decline. I believe that the Type I supernovas involve the stars of smaller mass which form a large amount of heavy elements from their neutron gas, including californium-254, and that Type II supernovas involve the stars of larger mass in which the neutron gas was heated so much that it could not form heavy elements.

If the science-fiction writer wishes to mix some of this stuff into the material of which his planets are formed, let him beware! There will be so much thorium and uranium that his planets will melt very quickly due to internal heating. Perhaps this is a source of planetary tragedy?

The other abundance differences likely to be produced in a Type I supernova are less spectacular. I would expect slightly larger amounts of silicon, chronium, manganese, and nickel, but by factors of less than ten.

The science-fiction writer speaks again: "Well, how about the stars hardly more massive than the sun

which are now ending their lives in large numbers, but apparently not in supernova explosions?"

He is right again, but I don't think it will do him very much good. Very little is known about the final stages in the evolution of these stars. I rather doubt that the central temperatures in these stars ever gets high enough to form iron. The temperature does get high enough to make carbon, and perhaps some of the intermediate nuclei are made. Then the conditions in the center of the star may become insufficient to maintain all of the nuclear energy sources; for example, the boundary between helium and carbon may cool off as the central region of the star slowly shrinks toward high density.

But high temperatures are not the only conditions which can drive nuclear reactions in nature. When nuclei are squeezed close together, the electrons help to partially neutralize their charges, and the nuclei can make much closer approaches than usual, increasing the rate of nuclear reactions. At very high densities, nuclear reaction rates are more sensitive to density than to temperature, and the reactions are better described as pycnonuclear reactions (Greek, *pyknos:* compact, dense) than as thermonuclear reactions. When the boundary between helium and carbon is squeezed to a density of between one and ten million grams per cubic centimeter, a nuclear reaction starts up between these two kinds of nuclei:

$$C^{12} + He^4 \rightarrow O^{16} + \varphi\text{-rays.}$$

This triggers a minor explosion which blows off a small part of the star. I believe this is at least one of the main causes of nova explosions. When the bulk of the star settles back again to the high density condition, another explosion is triggered. This series of explosions continues until the pressure of the degenerate electrons can support the star indefinitely at a density less than the critical one. The star then becomes a white dwarf which slowly cools.

If these ideas are correct, then the main effect of the stars of smaller mass is to take carbon produced in supernova explosions and to change some of it into nitrogen isotopes in the carbon-nitrogen cycle:

$$C^{12} + H^1 \rightarrow N^{13} + \varphi\text{-rays,}$$
$$N^{13} \rightarrow C^{13} + e^+ + \nu,$$
$$C^{13} + H^1 \rightarrow N^{14} + \varphi\text{-rays,}$$
$$N^{14} + H^1 \rightarrow O^{15} + \varphi\text{-rays,}$$
$$O^{15} \rightarrow N^{15} + e^+ + \nu,$$
$$N^{15} + H^1 \rightarrow C^{12} + He^4.$$

This cycle is mainly responsible for hydrogen to helium conversion in stars somewhat more massive than the sun, except of course those made initially of pure hydrogen. Most of the carbon-13 and nitrogen-14 in the solar system was probably formed this way. Thus a very old planetary system may have less nitrogen, and a very young one may have more nitrogen than our own.

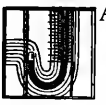
THE END

Illustrated by Schoenherr

A TASTE OF POISON

By CHRISTOPHER ANVIL

Truth woud be real handy to have! in the meantime, Belief — whether it's a man or an alien who's doing the Believing—can be made remarkably useful ...



AMES CARDAN strained to move his left arm, which lay dead still across his chest. But like everything else he'd tried to move since he came to, the arm lay where it was.

Cardan knew that he was on his back, lying as if he'd been thrown down bodily. It was perfectly dark where he was, cool, and very quiet. He could sense the position of his limbs, and with his outstretched right hand could feel a little of the smooth surface he was lying on.

But he couldn't move.

Cardan forced himself to think back, to see if he could find out what had happened.

He had, he remembered, been driving back from the meeting he'd called at the branch office in Milford. As the car's headlights reached far ahead in the moonless night, his mind circled back again and again to the problem the meeting hadn't solved. The violent arguments as to if, how, and when the company should install an electronic computer were still echoing through Cardan's consciousness as he spotted his short-cut up ahead.

Cardan glanced in the rearview mirror, and let up on the gas. He tapped the brakes lightly, and swung off onto a back road that cut over the ridge and around hairbreadth curves to join Route 36. He slowed the car for a moment to study the water trickling down the hilly dirt road, then stepped on the gas.

As usual, he got going too fast, and the car went into a shuddering vibration on the corduroy ridges of the road. Cardan grunted, slowed down, and reached over to press in the lighter, meanwhile shifting his dead cigar to the other corner of his mouth.

The trouble, he told himself, guiding the car with automatic skill around the swinging curves, was that no one seemed to know how a computer would actually work out in any specific case. Cardan believed that his own special skill, which had put him at the head of the firm, lay in his ability to draw out the truth in what a man said from the general mass of overstatement, obscurity and prejudice. But in this problem, his special skill was of no more value than a water pump with its intake pipe in a dry well. After he separated out the obscurity, overstatement, and prejudice, there was nothing left.

The lighter popped out, and Cardan waited till he came to a straight stretch, then groped for it, keeping his eyes on the road. He puffed the cigar alight, and felt around to get the lighter back in its socket. He drove steadily for some time, then pressed harder on the gas to gather speed for the last uphill stretch before he reached the top.

For the sixth or seventh time since leaving the meeting, Cardan's mind was sifting over the violent partisan arguments. Cardan, who despised yes-men, and only hired anyone who plainly had the backbone to stand up and state his own opinion, now asked

himself how he had come to end up with such a bunch of bull-headed egomaniacs.

The car topped the rise, dipped down around a sharp curve—and Cardan brought the car to a sudden stop.

A medium-sized pine lay across the road directly in front of him.

Cardan shifted the once-more-dead cigar to the other side of his mouth, and jabbed the lighter back in its socket. The road was so narrow that there were few places where he could turn around, and to back down the steep curving slope at night would take a long time.

The lighter popped out, and he puffed the cigar alight, thinking furiously. The tree ahead wasn't too big. "Let's see," he thought, "didn't I get one of those all-steel rubber-handled hatchets with a leather case and put it in the trunk about the same time I got the chains—after the car got struck on that hunting trip and we had to wrench branches off the trees to get some kind of traction?"

Cardan cramped the wheels of the car toward the side of the road where there was the hill instead of the ravine, made sure the parking brake was set, shut off the ignition and got out. He stretched his cramped limbs, drew in a deep breath, was surprised to smell a faint geranium-like odor, and—

—Found himself lying on his back in a cool dark place, able to sense the position of his body, but unable to move.

Feeling a sense of grim satisfaction that he had at least discovered part of what had happened, Cardan filed away that geranium scent for future reference. Before he had time to do anything else, a vertical gray line appeared on the wall opposite him. The line rapidly widened to a gray block, with the shadow of a low mound at its base. The mound moved, like a loose pile of rope from which a free end rose up of its own accord, to hold horizontally what appeared to be a short length of pipe.

There was a hiss, and a geranium-like scent was strong in the air.

Cardan was aware, first, of a lapse of time. Then he sensed that he was on his feet, held upright by something that gripped him under each arm, and at the waist, knees, and ankles. What felt like a set of padded clamps pressed against the sides of his head. There was a faint prickling sensation across his forehead and along the top, both sides, and the back of his head. It felt to Cardan as if a great many sharp points were evenly pressed against his scalp.

Directly behind him, there was a conversation going on that he couldn't quite get into focus, while somewhere in front of him and off to his left there was a sound of splashing.

Cardan cautiously tried to move his limbs, and got no response. He mentally summarized what he knew of his situation, and discovered that all he knew was that he was unable to move and was in a dark cool

place where he had seen a shadow that made no sense, and now heard various sounds that added up to nothing familiar. He wished to get out of this place; but paralyzed from head to foot, how was he to do it?

Cardan mentally grumbled to himself, and an habitual impulse went out that would ordinarily shift a dead cigar from one corner of his mouth to the other. Then there was a pause corresponding to the time needed to puff the cigar alight, and then Cardan was deep in thought. His thought wasn't in words or logic, but was a mental groping, with an inner sensation like that of a man in a darkened room searching through the things in his pockets for a match.

In time, Cardan's thoughts seemed to gradually focus, and then come to a point, and there rose up from the depths of his unconscious a mood, a set of attitudes like those of a man who fits the point of a wedge into a crack, then eyes it calculatingly, and reaches for a sledgehammer. At the same instant, he thought, "Somebody wants to know something." With this thought impulses started out along certain nerves that would ordinarily slightly narrow his eyes, and adjust the cigar between his clamped teeth at a certain specific angle that produced, in even his most pugnacious associates, a twinge of foreboding followed by a state of maximum alertness.

Then be became aware of an odd effect that had been going on for some time without his being conscious of it.

From behind him came the conversational gabble he had heard before, an out-of-focus noise like an earnest discussion being carried out on the other side of thick wall. But now, after each comment, words formed in Cardan's consciousness, as if an interpreter were translating the discussion for his benefit. The lag between gabble and translation decreased, and it suddenly occurred to Cardan that he seemed to be getting the meaning a little ahead of the translated words. He listened carefully, and heard:

". . . zz brgt hvd gdn nbbbn how does that show up on your dwell meter now?"

". . . grbbl bbz mbbd jj still too big a spread. Am I doing something wrong?"

". . . Bb zbbd zd you're overcorrecting. Here."

"Oh. I see."

Just before the two sounds merged, Carden was sure that he was getting the meaning a fraction of a second ahead of the translated words. It seemed first the meaning came to him, and then a part of his own mind translated the meaning into words. He puzzled over this, which seemed to be a kind of electronic telepathy.

Behind him, one of the voices said, "Higher. We don't want to unblock that far down."

"Here?"

"A little radially. There."

There was a stinging pain, as if a spark had landed between Cardan's shoulders and expanded in a puff of

flame through his chest, neck, and head. Cardan suddenly realized that he could now move the muscles of his chest, neck and head, but could not move even this part of his body freely, because of the clamps that gripped him. He tried to open his eyes, and found that they were partly open already. All he could see was a general dull gray shadow.

From off to Cardan's right, a voice spoke sharply. "Is the receiver ready?"

To Cardan's front and left there was a splash. "Taking a bath," came a new voice. "Why? The specimen's not ready yet, is it?"

"I don't know about the specimen. But I just got the warning signal from Control."

There was a low muttering noise, and a loud splash. Cardan, peering into the dimness, tried to look not quite directly at the source of the noise. He saw a vague series of upright wavering forms, which, seemed at first like streamers of a dark flame, and which then produced a mental picture of snakes weaving upright in a circle.

Behind him, a voice said sharply, "There. It had a thought."

"Where?"

"Gone now. But it must be coming to."

To Cardan's right, a voice said sharply, "Hurry!"

From the place Cardan was watching came a sound like a sail slatting in the wind, and then a low brisk rubbing sound. He could now only make out a vague mass.

Gradually, Cardan was forming an opinion about whatever it was that had captured him. The thought caused a chilly sensation to travel up and down his spine, and this in turn caused his jaw muscles to set an imaginary cigar at a more pugnacious angle. Simultaneously, the muscles around his eyes tensed. His face, in the shadowy room, took on a look which often created a paralytic hesitancy in people who had succeeded in getting him at a disadvantage.

Meanwhile, in the depths of his mind, an intense sifting process continued, and Cardan was aware, now and then, of a vague mental image.

Behind him, a voice said, "*There.* No, my mistake. Wait. *There,* again."

The excitement Cardan realized, sprang up each time he saw a mental picture. Cautiously, he formed a fuzzy mental picture of a wrist watch floating in space.

"It's almost conscious," said the voice.

"Keep an eye on it. I'm going to have a spare contact put on standby."

A voice from the right called, "Specimen ready?"

"Not yet. It's slow coming to."

"Hurry it up. *Receiver!* Control red!"

The low rubbing sound out in front of Cardan stopped abruptly. Behind him, a low voice said, "Try the stribulator."

A vague scatter of sparks crossed Cardan's field of vision.

To his right, someone called sharply, "Control red-yellow!"

"Coming." A clicking thumping noise rapidly approached.

There was another vague scatter of sparks across Cardan's field of vision. An instant later someone called tensely, "Control yellow!"

It was clear to Cardan that something was about to happen. He peered alertly into the gloom, and was rewarded when a very dim light snapped on overhead, revealing a thing like a dentist's chair, with a variety of padded armrests held up by jointed, faintly glimmering polished rods.

"Control blue-yellow!"

Into this chair hurtled a sizable monstrosity, like a tangle of snakes around a central mass. Cardan, trying to get it into focus, had the impression of a kind of squid, which hastily distributed its arms on the multiple rests, gave a final twitch, and sat intensely still.

A humming tone sounded. To Cardan's right, a crisp voice spoke:

"Sector 139, sir. We have a planet, and a specimen of a moderately intelligent race."

The thing in the chair opposite Cardan stirred, then spoke in an incisive voice, entirely different from what Cardan had heard before.

"Spotlight," it said sharply.

A sizable lens overhead gave a feeble glow, like a flashlight with nearly dead batteries. The creature in the chair leaned forward, as if peering at Cardan. The central mass of the creature, seen from directly in front, looked like a huge inverted horseshoe. Cardan made out a faint reflected glimmer in the dark space inside the horseshoe-shaped body, and suddenly realized that that dark space might be one huge eye.

After staring at Cardan for some time, the thing drew back with a faint leathery creaking sound.

"Enough," came its voice. "Dim that light."

The feeble glow faded out. Cardan thoughtfully filed away the information that these creatures might have uncommonly sensitive eyes. He also noted that they seemed to have some kind of scientifically-assisted possession process, by which a distant authority could communicate through the body and senses of a "receiver."

The creature opposite Cardan spoke, using the tone of a busy person who has no time to waste. It said, "This is the dominant species?"

"Yes, your excellency."

"It is intelligent?"

"Moderately so, sir."

"Has it constructed artificial aids? Can it manipulate tools?"

"Yes, your excellency, to both questions."

"Then where is its eye?"

There was a little pause, then the hesitant answer, "It has microeyes, your excellency. They're a . . . a little hard to find. High up, in the receptor head."

Another little pause followed. "Oh. I see. Yes, of course." Cardan thoughtfully noted the irritation in the voice, "All right," it said, "now, directly below the microeyes is a verti-

cal ridge with two small holes at the bottom."

"Air-duct openings, your excellency."

"And below that?"

"The food-intake and mastication apparatus."

"How does it communicate?"

"Well, sir we think it can talk. But there are technical difficulties with this specimen, and—"

"None of that. Can you or can't you get it to talk?"

"Well, you see, your excellency—"

"Yes or no?"

There was a silence. A somewhat more authoritative voice spoke up, and Cardan recognized the executive protecting his assistant from an angry superior.

"You see, Chairman Thall," said the new voice, "the specimen's vocal centers have been zztically stimulated under anesthesia, and calibrated. Naturally, I know nothing of the details. But I have heard the creature make sounds while unconscious. What Mr. Stol meant to say—"

The chairman gave a low, inarticulate sound that translated an instant later as "Gah." Then it said sharply, "Listen, will it talk to me *now?*"

Yet another voice cut in, "No, sir. The technicians have had hours to run through the standard routines. But they're hung up. Why, I don't know."

"Ah," growled the monster in the chair, and Cardan listened intently to the antagonism in the voice. "So it's you again, Skaa? Another planet, eh?"

"Yes, sir. My ninth."

"And the technicians have had several hours' to 'run through the routines'—is that what you said?"

"That's right, sir. They have."

There was a pause, then the voice spoke more smoothly. "Well, then, suppose you describe this planet to me yourself."

"Gladly, sir. The planet has suitable gravity and atmosphere. About a fourth is land area. Night on the planet is blinding, but day is just about right. We have carried out a quick examination, and find that most of the plant life is edible. A number of the animal forms, however, are evidently posionous to us."

"What do you mean, 'evidently'?"

There was a silence, and Cardan sensed a developing tension in the room.

"Well, your excellency," said the voice of Skaa, "as you know, I am a believer in the direct methods of General Meio. Rather than spend the next hundred years carrying out elaborate tests to see what might be poisonous, I offered a bonus to volunteers, who ate samples."

"How many volunteers did you lose this time?"

"Thirty-nine and three still doubtful."

"Forty-two! Just what is your total by now?"

"Eight usable planets discovered, and three partly settled. Has anyone a higher record?"

There was a long silence. Then the creature in the chair spoke in a voice

that had an undertone like snapping sparks. "How do you replace these losses?"

"I give the surviving volunteers their bonus, and a steep increase in mating allotments. I up the general mating norm. Between one planet and the next, there's time to raise a new set of basic workers, and train up replacements from the crew for any technical spots vacated."

"So far, you've been lucky. If the odds—"

"The devil with the odds."

Cardan admiringly told himself that this Skaa was no yes-man. On the other hand, Chairman Thall sounded as if his patience was strained to the breaking point Cardan's imaginary cigar shifted around thoughtfully.

Chairman Thall's voice, rigid with self-restraint, said, "Very well. Now, your recommendations as to this planet?"

"Wipe out the dominant life form, then settle the planet."

"You consider the dominant life form might be more dangerous than useful?"

"I do. At present they have a passable civilization, and use atomic fission in weapons and embryonic power applications. My examination was quick, so it's hard to say if they have fusion or not. It doesn't matter. They are plainly split in competing geographical fragments. Progress is going on. Who knows when their science may develop beyond science? We should wipe them out now, while it's easy."

"You're certain they're not dangerous as yet?"

"Positive. I checked that carefully."

"Then I agree. 'Fix them while they're little, or when they're big they may fix you'."

"Yes, sir," said Skaa. "Exactly."

"Well, now that that's settled, let's hear this creature talk. A life form as weird as this one shouldn't die without a few words on record."

There was a grating noise from here and there around the room, like bones being ground up. This translated belatedly as a sound of hearty chuckling.

Cardan's face smoothed out as if

a switch had been thrown, disconnecting the muscles of his face from what went on in the brain within.

The creature in the chair leaned forward.

"Speak up, specimen."

Feeling his way cautiously, Cardan said in respectful tones, "Yes, your excellency?"

There were numerous small creakings, clicks, and stirrings in the room. Cardan gathered that he had a sizable audience. From behind him came vague mutterings, and Cardan remembered that to these huge-eyed creatures, thought without mental images was unthinkable. For their benefit, Cardan produced a mental picture of a vague, many-limbed creature.

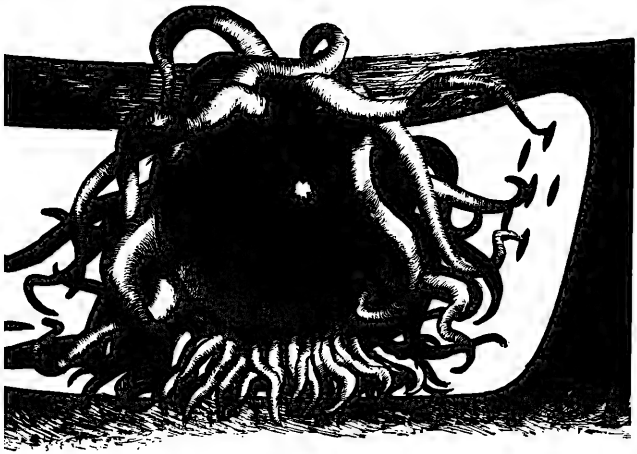
The monster in the chair said, "You've heard our conversation, then?"

Cardan said humbly, "I heard you talking, your excellency."

The creature spoke to Cardan in the tone of an adult speaking to a child. "I mean, did you *understand* what we were talking about."

Cardan made foggy mental pictures of undistinguishable objects. He said, "I lost track, your excellency. I mean, I figure the boys below can handle it. It's not my job."

A slight pause followed, filled with numerous creaking noises from around the room.



"Boys below?" said Chairman Thall inquiringly.

"Yeah," said Cardan. "I mean, yes, your excellency."

"You mean to say, *the people down on your world?*"

Cardan visualized a vague, slightly lopsided sphere. "Well, no, your excellency. The guys *underneath.* What I mean— It's a . . . a" He pictured a vague mass with odd bumps sticking out here and there, then let it fade out. "I can't think of the word."

The creature seated before Cardan snapped, "Psychotechnicians! What is the intelligence of this creature?"

"As a rough estimate, your excellency, we would say the intelligence factor is around forty."

"Forty! What is the use of talking to an idiot?"

Cardan judged that the time was right for the first rap on the wedge. He said plaintively, "Your excellency, maybe I'm no brain, but you won't find a harder worker anywhere under the sun. Or under the moon, either."

At the word "moon" there was a general creak and clack all over the room. Someone spat out a low curse.

"Moon!" thundered the chairman. "Does this planet have a *moon?*"

"Yes," said the voice of Skaa angrily, "it *does* have a moon. Planets often do, you know, and this has only *one* moon, anyway."

"How bright is it?"

"I don't know. As it happens, it's in the planet's shadow right now."

"Specimen," snapped the creature, turning in its chair, "how bright is your moon?"

Cardan visualized a huge dazzling disk. "It's better not to look straight at it, your excellency."

"I see. Someone snap on that spotlight. Is it brighter than that?"

The feeble glow lit up behind its lens. If this bothered the big eyes of the aliens, Cardan could imagine what moonlight would do. For the benefit of the psychotechnicians, Cardan visualized a mental comparison showing the glaring moon on one side, and a faint glimmer on the other side. Aloud, he said, "It's a whole lot brighter than that, your excellency."

Skaa's voice cut in. "After all, it's only *one* moon, your excellency." It can be devegrated; it wouldn't cost too much to zzzpostuzztalate the whole thing."

"Might not cost much," snapped the chairman, "but if you know anything, you know it only takes one single mistake, and the whole surface will crystallize over with an albedo like polished chromium."

"There is that *possibility,* but—"

"You should have *told* me there was a moon. Now just keep quiet."

"It doesn't make any—"

"Shut up, I said!" The chairman's voice rose menacingly, and a tight silence gripped the room.

Cardan, satisfied he had the point of the wedge driven into the crack, bided his time. Meanwhile, he let an occasional vague mental image drift

through his mind, to keep the psychotechnicians occupied.

The monster in front of him grumbled, "Seeing that you won't give me the information you ought to, I'll have to wring it out of this alien idiot here. Who knows what else you haven't told me?"

"Sir," said Skaa stiffly, "if you'd asked me, I'd have told you. But—"

"But you're in a hurry to go out and discover another planet, and run up your record? And let somebody else come here and do all the work?"

"I think," said Skaa coldly, "that my record justifies my actions. If you want to call a Board of Inquiry, I'll be glad—"

Cardan, who wanted to use this antagonism for his own purpose, suddenly realized that the situation might blow up prematurely. In a loud voice, Cardan spoke up:

"Why should I tell them about Underneath? Who *are* those guys, anyway?"

Skaa's voice cut off abruptly. From that direction, Cardan could hear several low earnest voices, as if Skaa's subordinates were trying to argue him out of a head-on clash. The chairman—the monster seated directly opposite Cardan—was also silent; Cardan thought he could understand the situation. Settling planets must be like opening a great many boxes, an unpredictable percentage of which contain booby traps. After the first ruinous explosion, the man in charge will insist on precautions. But new workers, hired after the wreckage from the explosion has been cleared away, will come to doubt the need for precautions. Cardan could imagine that the chairman must ache and yearn for a *small* explosion, to teach the headlong Skaa some caution. And right now, the chairman was probably relieved that the alien idiot had opened its mouth just in time to prevent a showdown.

"Hm-m-m," said the chairman, twisting around with a leathery creak, "so, you don't like moonlight, eh?"

"No, your excellency," said Cardan. He decided it was time to tap his wedge in a little farther, and let a vague mental picture of the moon drift through his mind, followed by a sharply visualized rectangle. Behind him, there was a murmuring, as the psychotechnicians conferred about this new phenomenon.

"Now," growled the chairman, "your planet has only *one* moon, hasn't it?"

"That's right, your excellency. There's only one big moon."

"One *big* moon!" the chairman exploded. "Are there any small ones?"

"No, your excellency," said Cardan humbly.

"All right," growled the chairman. "Now then, what was that remark about 'boys below'?"

"Well, just that, your excellency."

"'Just that'? Just *what?*"

"I mean, they're underneath. You know."

There was a sound as of steam escaping under pressure. "Psychotechnicians!" roared the monster

"Yes, your excellency?"

Cardan let a vague image drift across the sharply defined rectangle as the chairman said furiously, "Is this specimen evading my question on purpose?"

"No, your excellency. The creature is stupid. It just doesn't understand."

"Then how am I to get an answer out of it?"

"If you could get it to start talking, your excellency, it might be possible to guide the conversation, and get at the information indirectly."

"I see."

Skaa's voice cut in irritatedly. "How can anyone get information out of an idiot? Can you squeeze blood out of a vacuum?"

"Keep out of this," said the chairman warningly.

Cardan, sensing another premature crisis, drew in his breath and sneezed loudly, then sneezed again, and again.

The chairman swiveled around angrily. "Now, what's wrong with *you?*"

In the background, Cardan could hear low voices arguing with the muttering Skaa. Very humbly, Cardan said, "I'm sorry, your excellency. My nose tickled. I sneezed."

"All right," said the chairman illtemperedly, "now let's get on with this." He added angrily, "And I *hope* there will be no more interruptions."

Cardan stood in humble silence, and made his mental image of the rectangle clearer and sharper, while allowing a fuzzy blob to half-form and drift over it.

Behind Cardan, there was a low confused muttering. Off to his right he heard Skaa spit out an epithet, while another voice pleaded urgently, "No, no, don't do it!"

The chairman was saying angrily ". . . Picture is pretty confused and I want to fill in the details. At least, do your best and *try* to understand. Now when you speak of this 'underneath,' do you mean—"

Behind Cardan, one of the psychotechnicians muttered, "He isn't going at it the right way."

"Well, don't get mixed up in it. There's nothing *we* can do. But, say, look at this image."

Cardan was very gradually enlarging the rectangle.

One of the psychotechnicians said, "Remarkable image persistence for this creature. Almost like an entirely different—."

To Cardan's right, Skaa's voice was gradually becoming louder, despite the clamor of pleading voices around him.

". . . Do you mean," the monster in the chair facing Cardan was saying, "that they are *physically* underground, or—"

"All I know, your excellency," said Cardan quickly, "is my own job, and what I read in the papers, and—."

"All *right,*" snarled the creature, leaning forward, "start there then. What *is* your job?"

Cardan had the momentary balancing sensation of the man who eyes

the wedge as he readies the sledge-hammer. Then he began to speak, his voice earnest, eager to please.

"I'm a dollar-mender, your excellency. I mend dollars. Some get torn, and others get wrinkled. I put them in the 'In' slot, and throw the switch down. Then when the red light flashes, I take them out the 'Out' slot, and feed them in the drier. Oh, I forgot. I throw the switch up after I take them out of the machine. See, because the cycle's finished. Then I take some more dollars off the belt, put them in the 'In' slot, and throw the switch down. When the red light flashes, I take them out the 'Out' slot and—."

There was a universal creak and clack all around Cardan. The faintly visible chairman had what seemed to be a stupefied look. As Cardan rattled on, Skaa's voice cut in sarcastically, "Fill in the details. Very important, you know, to fill in the details. Yes, sir. Here we stand, officers of the Fleet. We could be doing our duty. But instead here we stand, awash in claptrap. 'Throw up the "Up" switch. Reach in the "Out" slot.' Oh, this is a dangerous alien race, I tell you. We must proceed with great caution, as our noble leader here—"

The chairman's voice came out in a crackling roar. "That will do! *Guards!*"

Cardan, satisfied that the situation had come to a head, and that his reputation for stupidity was now unshakably established, suddenly altered his mental picture. Within the rectangle, he visualized numerous radiating lines, drawn from a common center. Slowly, then faster and faster, these lines began to whirl. The rectangle enlarged, and the whirling lines spun faster, till they filled his entire field of mental vision.

Behind him, Cardan could hear the sudden exclamation. Concentrating hard, he made the spinning spokes whirl yet faster, the central hub enlarging till it in turn filled his entire field of vision.

He then immediately visualized everything he could think of. Slide rules, microscopes, cameras, photographs, paint brushes, apples, revolvers, ammunition, graph paper, pencils, pens, atomic models, ring stands, hunting rifles, lions, cats, dogs, bears, maps on old parchment, algebraic formulae, tables of integrals, radar sets, oscilloscopes, vacuum tubes, condensers, transistors, remembered drawings of futuristic devices, lightning bolts, coils of wire hanging in space. As fast as he could think of anything, he pictured it, and thrust it aside to picture something else.

Behind him rose a scream, a wild shriek that wavered over the hubbub to bring a sudden silence, and then a roar from the chair, *"Now* what's happened?"

"Sir . . . your excellency," shouted the psychotechnician. "It's *changed!*"

"What do you mean?"

"The alien isn't the same any more. *Its intelligence factor is over three hundred!"*

Judging that this was the moment of maximum confusion, Cardan spoke in a voice as coldly flat and authoritative as he could make it. "You are no longer talking to the dollar-mender. I am an Underman. I now occupy this body."

There was a tense silence, and Cardan, moving fast, said flatly, "My mind is now shielded from your technology." He had visualized a gray blur, like blowing fog. "I will remain here only long enough to deliver this warning:

"The planet below is occupied by many power groups. They are rivals, and have for generations hidden their newest advances from one another. To avoid a childish secrecy which hides things from itself as well as others, they have built complete, self-sufficient installations underground. Only those of the highest ability can go below, and these must mate only among themselves. In these conditions, progress has been swift. *But no new device is permitted on the surface until it is certain that it cannot suggest secret developments to a rival.* The devices visible to you are obsolete surface devices, which give no measure of the present power of this planet." Cardan paused for just an instant, then added:

"You are warned. You now have sufficient information to make your decision. If you attempt to injure anyone below, you will be destroyed. If you wish to depart peacefully, you will so signify by returning this captive unharmed. You will then leave.

"Our wishes for your happiness and advancement go with you.

"Good-by."

Cardan visualized a spinning mass, which withdrew to show whirling spokes, then a rectangle that enclosed the spokes and then that shrank, till the spokes slowed and vanished, and then the rectangle itself was gone.

For a long moment, Cardan waited, like a general whose reserves have been sent into action. The silence stretched out.

Then, suddenly, the creature before Cardan said, *"Wait!"*

"Too late, your excellency," said the psychotechnician, "he's gone. He's broken contact."

There was another silence, then a creaking and a stirring in the room.

To Cardan's right, there was a ponderous clanking, as of a many-limbed creature being led off with all its many limbs in chains.

"Wait, guards," said the chairman, a hint of benevolence mingled with the triumph in his voice. "What do you say now, Skaa?"

Skaa said slowly, "I can see I must have been wrong somewhere, your excellency."

"You *admit* I was right?"

There was a long pause. The chains rattled. Reluctantly, Skaa said, "Yes."

"Ah-ha." The chairman's tone was almost genial. "And do you apologize for what you started to say back there?"

Another pause followed. Then, in a tone of deep depression, the words, "I apologize."

"Good. Fine! Guards! Unchain him!"

There was a clatter and thud that went on for about thirty seconds.

The chairman's voice said, "Now, Commander Skaa, as soon as possible have this specimen carefully set down on his home planet. Then get out of here. And take my advice. Don't mope over this. You're still young. There are other worlds to conquer. When you bite into something and taste poison, the only thing to do is spit it out. That's common sense."

There was a faint hiss nearby, and Cardan smelled a strong, familiar, geraniumlike odor.

Cardan was vaguely aware of a lapse of time before he felt a sensation like a puff of flame that burst through his body from the back to the ends of his limbs. He sat up to see the gray light of dawn in the east. He was in his car behind the wheel, with the engine turned off and a medium-sized pine dragged to the side off the road ahead.

Cardan pressed in the car's lighter, and felt in his inside coat pocket for a cigar. Stripping off the outer wrapper, and biting off a bit of the end, he put the cigar in his mouth. The lighter popped out, and he puffed the cigar alight.

"Hm-m-m," he said, looking out through clouds of smoke. A section of his mind was trying to argue him around to the belief that he had fallen asleep and dreamed the incident.

Cardan snorted. He rolled the window down a little way, and took a light cautious sniff of the outside air. It smelled fresh, and free of any geraniumlike odor. Carefully, he got out, and bent to look at the wet dirt of the road. It was covered with numerous thick curving marks, as if a multitude of flexible-limbed creatures had hastily bundled the tree off to the side of the road.

"You *see,*" growled Cardan, to the skeptical part of his mind. Grumblingly, it subsided. He shifted the cigar around to the other side of his mouth, picked up a small piece of branch on the road to scrap the worst of the mud off the bottom of his shoes, got back in the car, slammed the door and started the engine.

"Hm-m-m," he said again. It had just occurred to him that he had just about decided to get a computer. He fished around to find the reason for this development, and found that a number of ideas had rearranged themselves, under the crystallizing influence of some comment he had heard recently. But what was the comment?

He was well down the winding dirt road near the highway when it came to him. It was a remark he had overheard back in that dark room: "You never know when their science may develop beyond science."

Cardan shifted his dead cigar from one corner of his mouth to the other.

An intense curiosity was starting to develop within him.

". . . *What was beyond science?*"

THE END

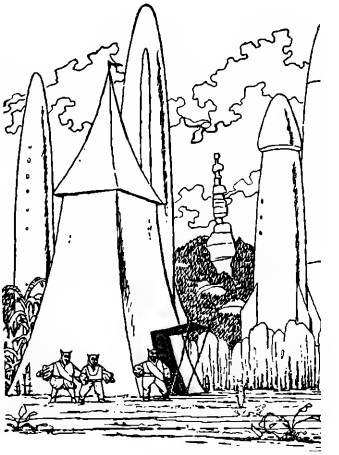
THE HIGH.

SYNOPSIS

The spaceship captain opened the translated chronicle and began to read. It might explain what he had found on this planet . . .

I, Brother Parvus, a friar of the abbey at Ansby in Lincolnshire, do here record that in the year 1345 our baron, Sir Roger de Tourneville, was gathering at his castle an army of free companions to go join King Edward in the French war. Besides himself, the band included two knighted men, old Sir Brian Fitz-William and dashing young Sir Owain Montbelle. Half Welsh, but educated in courtly circles, the latter was a guest pleasing to Sir Roger's wife Catherine, who in this remote and backward fief missed the graces of her own high-born Winchester family. Even her small children, Robert and Matilda, were scant consolation for her husband's well-meaning but rough manners and frequent warlike absences.

Our town was a broil of men-at-arms, archers, and cavalrymen when the Wersgor ship landed. A monstrous cylinder, it descended from the sky. As the people crowded around, a squat creature of blue skin and bestial face emerged from a portal and shot down a man with a fire-bolt. Despite their horror, Sir Roger and his English soldiers did not flee as expected, but stormed up the gangway into the vessel, where they attacked so wildly that only one alien survived. I was put in charge of interrogating this prisoner.



Illustrated by van Dongen

. CRUSADE

By POUL ANDERSON

Second of three parts. A man with a sixteen-inch naval rifle is so apt to forget that someone with a stone axe can kill him just as dead . . . and that it's human thought, not weapons, that ultimately determine wars . . .

He was quick to learn some Latin from me, and to say he was not a demon—a claim somewhat reinforced by the fact that he did not go up in smoke when I led him through the Pater Noster—but a member of a nonhuman mortal race, the Wersgorix. His own name was Branithar. Having explained his unique astrological concept of suns and worlds scattered through space, he boasted that his people had been expanding through the universe for the past three hundred years. Where they found a planet similar to their own, they exterminated or enslaved any primitive natives there might be—like ourselves—and colonized the place with a few million only; for each wealthy Wersgor desired enormous and luxurious estates. Branithar's ship had been a scout searching almost at random for new territory. Its crew had meant to terrorize our neighborhood, load specimens of our soil and life aboard, and return home to report what they had found.

Sir Roger felt as skeptical of this wild tale as I. However, since other blue bandits might arrive from Huy Braseal or wherever they actually lived, he felt we needed knowledge of the captured ship and guns, and had been studying these. Branithar was forced to operate the vessel for us. It was so big that it could hold all the soldiers and the civil population of Ansby, with supplies and livestock. Sir Roger decided to utilize this capability. With such a comfortably housed, well supported force, in such an irresistible flying craft, he could end the French war, liberate the Holy Land, and be back with plunder and glory for even the lowliest serf—before hay harvest. Enthusiastically, his folk went aboard. I was one of a few clerics who accompanied them, with rather more forebodings.

Branithar raised ship—then, suddenly activated an automatic steersman and locked its controls. The ship left Earth itself at a speed faster than light. Branithar defied us to course for his home base, the planet do our worst to him. He had set a Tharixan, on the border of the Wersgor realm; nothing could release the homunculus operating our ship until we arrived. He counselled us to surrender at that time, and we must needs kept him unharmed as an interpreter.

Sir Roger put a cheerful face on the matter which reassured most of his people. Lady Catherine and Sir Owain were among the few who saw through this; more and more, they turned to each other's company for comfort. The leaders, and my humble self, used the time of the voyage to familiarize ourselves with the strange implements we found. Though these were built on esoteric principles, the actual use proved simple to anyone wont to wrestling with Earth's hand-operated engines. I also learned somewhat more of the blueskins' tongue, and more astrology. Their domain included about a hundred worlds, scattered across two thousand light years amidst a far larger number of stars useless to this form of life. Theoretically a republic,

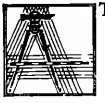
in fact the nation was a tyranny centered at its capital planet, Wersgorixan. There were three other star-traveling peoples known so far, but their power was insignificant and the Wersgorix forced them to remain weak.

Tharixan proved a typical planet of our foes, thinly settled, with only three fortresses. When the locked controls released themselves, Sir Roger flew to the nearest castle, hight Ganturath. Its suspicious commander sent fliers up to board us while his great fire-bombards aimed at us from the ground; for this ship was not big enough to carry the generators of those force fields which protected Ganturath from our flame weapons. Sir Roger shot down the fliers, and evaded the anti-spacecraft defenses by landing our vessel directly on the main keep, thus thoroughly wrecking both. His men rushed out and fell on the garrison. Since the Wersgorix had had no serious rivals for centuries—their conquests being mere slaughter of helpless savages—they had neglected the arts and equipment of hand-to-hand combat. We English soon overran them. Force screens did not stop material objects, so Sir Roger led a cavalry charge against the outlying emplacement and captured it intact, while the longbowmen of Red John Hameward brought down those small unarmored aircraft which swooped low to shoot at us. 'Twas a glorious victory.

Reluctantly, however, the baron yielded to the insistence of his captains that it was best we escape in the lesser spaceships we had seized before overwhelming force arrived from the other castles. But then we learned in horror that the navigational notes of the scouting expedition had been destroyed by a stray fire beam during the battle. Though Earth was not many days' straight-line travel away, the sheer number of unmapped stars, through which the scout had zigzagged almost at random, and the blurring effect of cosmic clouds, made it impossible to find our way home without close directions. Branithar, an engine-room officer, had not paid heed to the course and could give us no hint. Thus Sir Roger had no choice but to rally us for further trials. The prospect was not uncheering to him and he heartened most others with his promise of gold, glory, and ultimate triumphant return. But Lady Catherine turned on him for his rashness which had brought us to this pass.

Before the long night of Tharixan had worn away, an aerial armada reached us, summoned by fugitives from Ganturath who had gotten to a far-speaker on some estate. Because of the many prisoners we held, as well as uncertainty about us, the Wersgorix did not attack at once. Their leader, agreed to parley. My lord used the time thus gained to interrogate captives, prepare defenses, and let his men practice with the alien machines. Under threat of torture, Branithar proved a sullen but valuable help in all this. He was also learning a little English.

X.



T LAST it came time for the conference. Since most of his important followers were occupied with the study of enemy materials, Sir Roger made out a full score for his party by taking their ladies along in their finest clothes. Otherwise only a few unarmed troopers, in borrowed court panoply, accompanied him and me.

As they rode across the field toward that pergolalike structure which a Wersgor machine had erected in an hour between the two camps, of some shimmering pearly material, Sir Roger said to his wife: "I would not take you into peril like this if I had any choice. 'Tis only that we must impress them with our wealth and power."

Her face remained stony, turned from him toward the vast sinister columns of grounded ships. "I will be no more endangered there, my lord, than are my children back in the pavilion."

"God's benison!" he exclaimed. "I have made errors of judgment, aye, perhaps I should have left that cursed vessel alone in England. And yet, is it ever really wrong to do the bold thing?"

"If it endangers the harmless, yes," she said.

He bridled. "You swore at the wedding—

"Oh, yes. Have I not kept my oath? I have refused you no obedience." Her cheeks flamed. "But God alone may command my feelings."

"I won't trouble you any more," he said thickly.

This I did not hear myself. They rode ahead of us all, the wind tossing their scarlet cloaks, his plumed bonnet and the veils on her conical headdress, like a picture of the perfect knight and his love. But I set such words down here, conjecturally, in light of the evil luck which followed.

Being of gentle blood, Lady Catherine controlled her manner. When we drew up at the meeting place, her delicate features showed only a cold scorn, directed at the common foe. She took Sir Roger's hand and dismounted cat-graceful. He led the way more clumsily, with stormy brows.

Inside the curtained pergola was a round table, encircled by a kind of cushioned pew. The Wersgor chiefs filled one half, their snouted blue faces unreadable to us but their eyes flickering nervously. They wore metal-mesh tunics with bronze insignia of rank. In silk and vair, golden chains, ostrich plumes, Cordovan hose, slashed and puffed sleeves, curl-toed shoes, the English showed like peacocks in a henyard. I could see that the aliens were taken aback. The contrasting plainness of my friar's habit jarred them all the worse.

I folded my hands, standing, and said in the Wersgor tongue, "For the success of this parley, as well as to seal the truce, let me offer a Pater Noster."

"A what?" asked the chief of the

foe. He was somewhat fat, but dignified and with a strong visage.

"Silence, please." I would have explained, but their abominable language did not seem to have any word for prayer; I had asked Branithar. *"Pater Noster, qui est in coelis,"* I began, while the other English knelt with me.

I heard one of the Wersgorix mutter: "See, I told you they are barbarians. It's some superstitious ritual."

"I'm not so sure," answered the chief dubiously. "The Jairs of Bodavant, now, have certain formulas for psychological integration. I've seen them temporarily double their strength, or stop a wound from bleeding, or go days without sleep. Control of inner organs via the nervous system— And in spite of all our own propaganda against them, you know the Jairs are as scientific as we."

I heard these clandestine exchanges readily enough, yet they did not seem aware of my awareness. I remembered now that Branithar had seemed a little deaf, too. Evidently all Wersgorix had ears less acute than men. This, I learned subsequently, was because their home planet had denser air than Terra, which made them wont to hear sounds more loudly. Here on Tharixan, with air about like England, they must raise their voices to be heard. At the time, I accepted God's gift thankfully, without stopping to wonder why nor to warn the foe.

"*Amen*," I finished. We all sat down at the table.

Sir Roger stabbed the chief with bleak gray eyes. "Am I dealing with a person of suitable rank?" he asked.

I translated. "What does he mean by 'rank'?" the head Wersgor wondered. "I am the governor of this planet, and these are the primary officers of its security forces."

"He means," I said, "are you sufficiently well born that he will not demean himself by treating with you?"

They looked still more bewildered. I explained the concept of gentle birth as well as I could: which, with my limited vocabulary, was not well at all. We must thresh it over for quite some time before one of the aliens said to his lord:

"I believe I understand, *Grath* Huruga. If they know more than we do about the art of breeding for certain traits"—I must interpret many words new to me from context—"then they may have applied it to themselves. Perhaps their entire civilization is organized as a military force, with these carefully bred superbeings in command." He shuddered at the thought. "Of course, they wouldn't waste time talking to any creature of less intelligence."

Another officer exclaimed, "No, that's fantastic! In all our explorations, we've never found—"

"We have touched only the smallest fragment of the Via Galactica so far," Lord Huruga answered. "We dare not assume they are less than they claim to be, until we have more information."

I, who had sat listening to what

they believed were whispers, favored them with my most enigmatic smile.

The governor said to me: "Our Empire has no fixed ranks, but stations each person according to merit. I, Huruga, am the highest authority on Tharixan."

"Then I can treat with you until word has reached your emperor," said Sir Roger through me.

I had trouble with the word "emperor." Actually, the Wersgor domain was like nothing at home. Most wealthy, important persons dwelt on their vast estates with a retinue of blueface hirelings. They communicated on the far-speaker and visited in swift aircraft or spaceships. Then there were the other classes I have mentioned elsewhere, such as warriors, merchants, and politicians. But no one was born to his place in life.

Under the law, all were equal, all free to strive as best they might for money or position. Indeed, they had even abandoned the idea of families. Each Wersgor lacked a surname, being identified by a number instead in a central registry. Male and female seldom lived together more than a few years. Children were sent at an early age to schools, where they dwelt until mature, for their parents oftener thought them an encumbrance than a blessing.

Yet this realm, in theory a republic of freemen, was in practice a worse tyranny than mankind has known, even in Nero's infamous day. The Wersgorix had no special affection for their birthplace; they acknowledged no immediate ties of kinship or duty. As a result, each individual had no one to stand between him and the all-powerful central government. In England, when King John grew overweening, he clashed both with ancient law and with vested local interests; so the barons curbed him and thereby wrote another word or two of liberty for all Englishmen. The Wersgor were a lickspittle race, unable to protest any arbitrary decree of a superior. "Promotion according to merit" meant only "promotion according to one's usefulness to the Imperial ministers."

But I digress, a bad habit for which my archbishop has often been forced to reprove me. I return, then, to that day in the place of nacre, when Huruga turned his terrible eyes on us and said: "It appears there are two varieties of you. Two species?"

"No," said one of his officers. "Two sexes, I'm sure. They are clearly mammals."

"Ah, yes." Huruga stared at the gowns across the table, cut low in shameless modern modes.

When I had rendered this for Sir Roger, he said, "Tell them, in case they are curious, that our womenfolk wield swords side by side with the men."

"Ah," Huruga pounced on me. "That word *sword*. Do you mean a cutting weapon?"

I had no time to ask my master's advice. I prayed inwardly for steadiness and answered, "Yes. You have observed them on our persons in camp. We find them the best tool for

hand-to-hand combat. Ask any survivor of the Ganturath garrison."

"Hm-m-m . . . yes." One of the Wersgorix looked grim. "We have neglected the tactics of infighting for centuries, *Grath* Huruga. There seemed no need for them. But I do remember one of our unofficial border clashes with the Jairs. It was out on Uloz IV, and they used long knives to wicked effect."

"For special purposes . . . yes, yes." Huruga scowled. "However the fact remains that these invaders prance around on live animals—"

"Which need not be fueled, *Grath,* save by vegetation."

"But which could not endure a heat beam or a pellet. They wave weapons out of the prehistoric past. They come not in their own ships, but in one of ours—" He broke off his murmur and barked at me:

"See here! I've delayed long enough. Yield to our judgment, or we shall destroy you."

I interpreted. "The force screen protects us from your flame weapons," said Sir Roger. "If you wish to attack on foot, we shall make you welcome."

Huruga turned purple. "Do you imagine a force screen will stop an explosive shell?" he roared. "Why, we could lob just one, let it burst inside your screen, and wipe out every last creature of you!"

Sir Roger was less taken aback than I. "We've already heard rumors of such bursting weapons," he said to me. "Of course, he's trying to frighten us with that talk of a single shot being enough. No ship could lift so great a mass of gunpowder. Does he take me for a yokel who'll believe any tinker's yarn? However, I grant he could fire many explosive barrels into our camp."

"So what shall I tell him?" I asked fearfully.

The baron's eyes gleamed. "Render this very exactly, Brother Parvus: 'We are holding back our own artillery of this sort because we wish to talk with you, not merely kill you. If you insist on bombarding us, though, please commence. Our defenses will thwart you. Remember, however, that we are not going to keep our Wersgor prisoners inside those defenses!' "

I saw that this threat shook them. Even these hard hearts would not willingly kill some hundreds of their own people. Not that the hostages we held would stop them forever; but it was a bargaining point, which might gain us time. I wondered how we could possibly use that time, though, save to prepare our souls for death.

"Well, now," huffed Huruga, "I didn't imply I was not ready to hear you out. You have not yet told us why you have come in this unseemly, unprovoked manner."

"It was you who attacked us first, who had never harmed you," answered Sir Roger. "In England we give no dog more than one bite. My king dispatched me to teach you a lesson."

Huruga: "In one ship? Not even your own ship?"

Sir Roger: "I do not believe in bringing more than is necessary."

Huruga: "For the sake of argument, what are your demands?"

Sir Roger: "Your empire must make submission to my most puissant lord of England, Ireland, Wales, and France."

Huruga: "Let us be serious now."

Sir Roger: "I am serious to the point of solemnity. But in order to spare further bloodshed, I'll meet any champion you name, with any weapons, to settle the issue by single combat. And may God defend the right!"

Huruga: "Are you all escaped from some mental hospital?"

Sir Roger: "Consider our position. We've suddenly discovered you, a heathen power, with arts and arms akin to ours, though inferior. You could do a certain amount of harm to us, harassing our shipping or raiding our less firmly held planets. This would necessitate your extermination, and we're too merciful to enjoy that. The only sensible thing is to accept your homage."

Huruga: "And you honestly expect to— A hatful of beings, mounted on animals and swinging swords . . . bub-bub-bub-bub—"

He went into colloquy with his officers. "This confounded translation problem!" he complained. "I'm never sure if I've understood them aright. They *could* be a punitive expedition, I suppose. For reasons of military secrecy, they *could* have used one of our own ships, and kept their most potent weapons in reserve. It doesn't make sense. But neither does

it make sense that barbarians would blandly tell the most powerful realm in the known universe to surrender its autonomy. Unless it's mere bluster. But we may be completely misunderstanding their demands . . . and thereby misjudging them, perhaps to our own serious loss. Hasn't anyone got any ideas?"

Meanwhile I said to Sir Roger, "You aren't serious about this, my lord?"

Lady Catherine could not resist saying: "He would be."

"Nay." The baron shook his head. "Of course not. What would King Edward do with a lot of unruly blueFaces? The Irish are bad enough. Nay, I hope only to let myself be bargained down. If we can wring from them some guarantee to let Terra alone—and perhaps a few coffers of gold for ourselves—"

"And guidance home," I said gloomily.

"That's a riddle we must think on later," he snapped. "No time now. Certainly we dare not admit to the enemy that we're waifs."

Huruga turned back to us. "You must realize your demand is preposterous," he said. "However, if you can demonstrate that your realm is worth the trouble, our Emperor will be glad to receive an ambassador from it."

Sir Roger yawned and said languidly, through me: "Spare your insults. My monarch will receive your emissary, perhaps, if that person adopts the true Faith."

"What is this *Faith?*" asked Huruga, "for again I must use an English word."

"The true belief, of course," I said. "The facts about Him Who is the source of all wisdom and righteousness, and to Whom we humbly pray for guidance."

"What's he babbling about now, *Grath?*" muttered an officer.

"I don't know," Huruga whispered back. "Perhaps these, uh, English maintain some kind of giant computing engine to which they submit the important questions for decisions . . . I don't know. Confounded translation problem! Best we delay a while. Watch them, their behavior; mull over what we've heard."

"And dispatch a message to Wersgorixan?"

"No, you fool! Not yet, not till we know more. Do you want the main office to think we can't handle our own problems? If these really are mere barbarian pirates, can you imagine what would happen to all our careers if we called in the whole navy?"

Huruga turned to me and said aloud: "We have ample time for discussion. Let us adjourn until tomorrow, and think well in the meantime on every implication."

Sir Roger was glad of that. "Let's make certain of the truce terms, though," he added.

I was getting more facility in the Wersgor language with every hour, so I was soon able to elucidate that their concept of a truce was not ours.

Their insatiable hunger for land made them the enemy of all other races, so they could not imagine a binding oath exchanged with anyone not blue and tailed.

The armistice was no formal agreement at all, but a statement of temporary mutual convenience. They declared that they did not at present find it expedient to fire on us, even when we grazed our kine beyond the force screen. This condition would prevail as long as we refrained from attacking any of them who moved about in the open. For fear of espionage and missile dropping, neither side wished the other to fly within view of the camps, and would shoot at any vessel which lifted. That was all. They would surely violate this if they decided it was to their interest; they would work us harm if they saw any method of doing so; and they expected us to feel likewise.

"They have the better of it, sire," I mourned. "All our flying craft are here. Now we can't even jump into our spaceships and flee; they'd pounce ere we could elude pursuit. Whereas they have many other ships, elsewhere on the planet, which may hover freely beyond the horizon and be ready to assail us when the time comes."

"Nevertheless," said Sir Roger, "I perceive certain advantages. This business of neither giving nor expecting pledges . . . aye—"

"It suits you," murmured Lady Catherine.

He whitened, leaped to his feet, bowed at Huruga, and let us out.

XI.

The long afternoon allowed our people to make considerable progress. With Branithar to instruct them, or to interpret for those prisoners who understood the art in question, the English soon mastered the controls of many devices. They practiced with spaceships and small flying vessels: being careful to raise these only a few inches off the ground, lest the foe observe it and shoot. They also drove about in horseless wagons; they learned to use far-speakers, magnifying optical devices, and other esoterica; they handled weapons that threw fire, or metal, or invisible stunning beams. Of course we English had, as yet, no inkling of the occult knowledge which had gone into making such things. But we found them childishly simple to use. At home, we harnessed animals, wound intricate crossbows and catapults, rigged sailing ships, erected machines by which human muscles might raise heavy stones. This business of twisting a wheel or pulling a lever was naught in comparison. The only real difficulty was for unlettered yeomen to remember what the symbols on the gauges stood for—and this, indeed, was no more complicated a sicence than heraldry, which any hero-worshipping lad could rattle off in full detail.

Being the only person with pretensions to reading the Wersgor alphabet, I busied myself with papers seized in the fortress offices. Meanwhile Sir Roger conferred with his

captains and directed the most oafish serfs, who could not learn the new weapons, in certain construction work. The slow sunset was burning, turning half the sky gold, when he summoned me to his council board.

I seated myself and looked at those gaunt hard faces. They were animated with fresh hope. My tongue clove to my mouth. Well I knew these captains. Most of all did I know how Sir Roger's eyes danced—when hell was being hatched!

"Have you learned what and where the principal castles of this planet are, Brother Parvus?" he asked me.

"Yes, sire," I told him. "There are but three, of which Ganturath was one."

"I can't believe that!" exclaimed Sir Owain Montbelle. "Why, pirates alone would—"

"You forget there are no separate kingdoms here, or even separate fiefs," I answered. "All persons are directly subservient to the Imperial government. The fortresses are only lodging for the sheriffs, who keep order among the populace and collect the taxes. True, these fortresses are also supposed to be defensive bases. They include docks for the great star ships, and warriors are stationed there. But the Wersgorix have fought no true war for a long time. They've merely bullied helpless savages. None of the other star-traveling races dare declare open war on them; only now and then does a skirmish occur on some remote planet. In short, three fortresses are ample for this whole world."

"How strong are they?" snapped Sir Roger.

"There is one hight Stularax, on the other side of the globe, which is about like Ganturath. Then there is the main fortress, Darovafi where this proconsul Huruga dwells. That one is by far the largest and strongest. I daresay it supplied most of the ships and warriors we see facing us."

"Where is the next world inhabited by bluefaces?"

"According to a book I studied, about twenty light-years hence, Wersgorixan itself, the capital planet, is much further off than that—farther away than Terra, even."

"But the far-speaker would inform their emperor at once of what's happened, would it not?" asked Captain Bullard.

"No," I said. "The far-speaker acts only as fast as light. Messages between the stars must go by spaceship, which means that it would take a brace of weeks to inform Wergorixan. Not that Huruga has done so. I overheard him speak to one of his court, to say they would keep this affair secret a while."

"Aye," said Sir Brian Fitz-William. "The duke will seek to redeem himself for what we have done, by crushing us unaided ere he reports anything whatsoever. 'Tis a common enough way of thinking."

"If we hurt him badly enough, though, he'll scream for help," prophesied Sir Owain.

"Just so," agreed Sir Roger. "And I've thought of a way to hurt him!"

I realized gloomily that when my

tongue had cloven to my mouth it knew what it was doing.

"How can we fight?" asked Bullard. "We've no amount of devil-weapons to compare with what sits out in yon field. If need be, they could ram us, boat for boat, and count it no great loss."

"For which reason," Sir Roger told him, "I propose a raid on the smaller fort, Stularax, to gain more weapons. 'Twill also jar Huruga out of his confidence."

"Or jar him into attacking us."

" 'Tis a chance we must take. Come worst to worst, I'm not altogether terrified of another fight. See you not, our *only* chance is to act with boldness."

There was no great, demurral. Sir Roger had had hours in which to jolly his folk. They were ready enough to accept his leadership again. But Sir Brian objected sensibly: "How can we effect any such raid? Yon castle lies thousands of miles hence. We cannot flit thither from our camp without being fired upon."

Sir Owain raised mocking brows. "Mayhap you've a magic horse?" he smiled at Sir Roger.

"No. Another sort of beast. Hearken to me—"

That was a long night's work for the yeomen. They put skids under one of the smaller spaceboats, hitched oxen to it, and dragged it forth as quietly as might be. Its passage across open fields was disguised by driving cattle around it, as if grazing them. Under cover of darkness, and by God's grace, the ruse was sufficient. Once beneath the tall thick-crowned trees, with a screen of scouts who moved like shadows to warn of any blue soldiers—"They had the practice for it, poaching at home," said Red John—the work was safer but also harder. Not until nearly dawn was the boat several miles from camp, so far off that it could lift without being seen from Huruga's field headquarters.

Though the largest vessel which could possibly be moved thus, it was still too small to carry the most formidable weapons. However, Sir Roger had during the day examined the explosive shells fired by certain types of gun. He had had it explained to him by a terrified Wersgor engineer, how to arm the fuse thereon, so that it would go off on impact. The boat carried several of these—also a disassembled trebuchet which his artisans had constructed.

Meanwhile everyone not toiling with this was set to work strengthening our camp defenses. Even women and children were given shovels. Axes rang in the nearby forest. Long as the night was it seemed even longer when we labored thus exhaustingly, stopping only to snatch a piece of bread or a wink of sleep. The Wersgorix observed that we were busy—it could not be avoided—but we tried to conceal from them what we actually did, lest they see we were merely ringing the lesser half of Ganturath with stakes, pits, caltrops, and *chevaux-de-frise*. When morning came, with full daylight, our installations were

hidden from view by the long grass.

I myself welcomed such backbreaking labor, as a surcease from my fears. Yet my mind must worry them, like a dog with a bone. Was Sir Roger mad? There seemed to be so many things he had done awry. Yet to each successive question, I found only the same answer as himself.

Why had we not fled the moment we possessed Ganturath, instead of waiting till Huruga arrived and pinned us down? Because we had lost the way home, and had no chance whatsoever of finding it without the help of skilled space sailors. (If it could be found at all.) Death were better than a blind blundering among the stars—where our ignorance would soon kill us anyway.

Having gained a truce, why did Sir Roger run the gravest risk of its immediate breach by this attack on Stularax? Because it was plain the truce could not last very long. Given time to ponder what he had observed, Huruga must see through our pretensions, and destroy us. Thrown off balance by our boldness, he might well continue to believe us more powerful than was the truth. Or if he elected to fight, we should have our hands strengthened by whatever arms were seized in the forthcoming raid.

But did Sir Roger seriously expect so mad a plan to succeed? Only God and himself could answer that. I knew he was improvising as he went along. He was like a runner who stumbles, and must all at once run even faster so as not to fall.

But how splendidly he ran!

That reflection soothed me. I committed my fate to Heaven and shoveled with a more peaceful heart.

Just before dawn, as mist streamed among buildings and tents and long-snouted fire-bombards, under the first thin light creeping up the sky, Sir Roger saw his raiders off. They were twenty: Red John with the best of our yeomen, and Sir Owain Montbelle as chief. It was curious how that knight's often faint heart always revived at the prospect of action. He was almost gay as a boy when he stood there wrapt in a long scarlet cloak, listening to his orders.

"Go through the woods, keeping well under cover, to where the boat lies," my lord told him. "Wait till noon, then fly off. You know how to use those unrolling maps for guide, eh? Well, then, when you come to this Stularax place—'twill take an hour or so if you fly at what seems a reasonable speed hereabouts—land where you have cover. Give it a few shells from the trebuchet to reduce the outer defenses. Dash in afoot, while they're still confused; seize what you can from the arsenals and return. If all is still peaceful hereabouts, lie quietly. If fighting has broken out, well, do what seems best."

"Indeed, sire." Sir Owain clasped his hand. That gesture was not fated to occur between them again.

As they stood there under darkling skies, a voice called: "Wait." All the men turned their faces toward the inner buildings, where mist smoked

thickly. Out of it came the Lady Catherine.

"I have only now heard you were going," she said to Sir Owain. "Must you—twenty men against a fortress?"

"Twenty men," he bowed, with a smile that lit his face like the sun, "and myself, and the memory of you, my lady!"

The color crept up her pale countenance. She walked past a stone-stiff Sir Roger, to the younger knight, till she stood gazing up at him. All saw that her hands bled. She held a cord in them.

"After I could no more lift a spade this night," she whispered, "I helped twine bowstrings. I can give you no other token."

Sir Owain accepted it in a great silence. Having laid it within his shirt of chain mail, he kissed her scarred small fingers. Straightening, his cloak aswirl about him, he led is yeomen into the forest.

Sir Roger had not moved. Lady Catherine nodded a little. "And you are going to sit at table today with the Wersgorix?" she asked him.

She slipped away in the fog, back toward the pavilion which he no longer shared. He waited until she was out of sight before following.

XII.

Our people made good use of the long morning to rest themselves. By now I could read Wersgor clocks, though not precisely sure how their units of time compared to Terrestrial hours. At high noon I mounted my palfrey and met Sir Roger to go to the conference. He was alone. "Methought we were to be a score," I faltered.

His countenance was wooden. "No more reason for that," he said. "It may go ill for us in yon rendezvous, when Huruga learns of the raid. I'm sorry I must hazard you."

I was sorry, too, but wished not to spend time in self-pity which could be more usefully devoted to telling my beads.

The same Wersgor officers awaited us within the pearly curtains. Huruga looked his surprise as we trod in. "Where are your other negotiators?" he asked sharply.

"At their prayers," I replied, which was belike true enough. "There goes that word again," grumbled one of the blueskins. "What does it *mean?*"

"Thus." I illustrated by saying an Ave and marking it off on my rosary.

"Some kind of calculating machine, I think," said another Wersgor. "It may not be as primitive as it looks on the outside, either."

"But what does it calculate?" whispered a third one, his ears raised straight up with uneasiness.

Huruga glared. "This has gone far enough," he snapped. "All night you were at work over there. If you plan some trick—"

"Don't you wish you had a plan?" I interrupted in my most Christianly sweet voice.

As I hoped, this insolence rocked him back. We sat down.

After chewing on it a moment,

Huruga exclaimed: "About your prisoners. I am responsible for the safety of residents of this planet. I cannot possibly treat with creatures who hold Wersgorix captive. The first condition of any further negotiations must be their immediate release."

" 'Tis a shame we cannot negotiate, then," said Sir Roger via myself. "I don't really want to destroy you."

"You shall not leave this place until those captives are delivered to me," said Huruga. I gasped. He smiled coldly. "I have soldiers on call, in case you, too, brought something like this." He reached in his tunic and pulled out a pellet-throwing handgun. I stared down the muzzle and gulped.

Sir Roger yawned. He buffed his nails on a silken sleeve. "What did he say?" he asked me.

I told him. "Treachery," I groaned. "We were all supposed to be unarmed."

"Nay, remember no oaths were sworn. But tell his disgrace Duke Huruga that I foresaw this chance, and carry my own protection." The baron pressed the ornate seal ring on his finger, and clenched his fist. "I have cocked it now. If my hand unclasps for any reason before 'tis uncocked again, the stone will burst with enough force to send us all flying past St. Peter."

Through clattering teeth, I got this mendacious message out. Huruga sprang to his feet. "Is this true?" he roared.

"I-i-indeed it is," I said. "B-b-by Mahomet I swear it."

The blue officers huddled together. From their frantic whispers I gathered that a bombshell as tiny as that sealstone was possible in theory; though no race known to the Wersgorix were skillful enough to make one.

Calm prevailed at last. "Well," said Huruga, "it looks like an impasse. I myself think you're lying, but do not care to risk my life." He slipped the little gun back in his tunic. "However, you must realize this is an impossible situation. If I can't obtain the release of those prisoners myself, I shall be forced to refer this whole matter to the Imperium on Wersgorixan."

"You need not be so hasty," Sir Roger told him. "We'll keep our hostages carefully. You may send chirurgeons to look after their health. To be sure, we must ask you to sequestrate all your armament, as a guarantee of good faith. But in return, we'll mount guard against the Saracens."

"The what?" Huruga wrinkled his bony forehead.

"The Saracens. Heathen pirates. You've not encountered them? I find that hard to believe, for they range widely. Why, at this very minute a Saracen ship could be descending on your own planet, to pillage and burn—"

Huruga perked. He pulled an officer aside and whispered to him. This time I could not follow what was said. The officer hurried out.

"Tell me more," said Huruga.

"With pleasure." The baron leaned back in his seat, at cross-legged ease. I could never have achieved his calm. As nearly as I could gauge, Sir Owain's boat must now be at Stularax; for recall how much slower this conversation was than I have written it, with all the translation, the pauses to explain some uncomprehended word, the search for a telling phrase.

Yet Sir Roger spun out his yarn as if he had eternity. He explained that we English had fallen so savagely upon the Wersgorix because their unprovoked attack led us to think they must be new allies of the Saracens. Now that we understood otherwise, it was possible that in time England and Wersgorixan could reach agreement, alliance against this common menace—

The blue officer dashed back inside. Through the door-flap I saw soldiery in the alien camp hurrying to their posts; a roar of awakening machines came to my ears.

"Well?" Huruga barked at his underling.

"Reports—the far-speaker—outlying homes saw bright flash—Stularax gone—must have been a shell of the superpowered type—" The fellow blurted it out between his pantings.

Sir Roger exchanged a look with me. Stularax gone? Utterly destroyed?

Our aim had only been to reave some more weapons, especially light portable ones for our men-at-arms. But if everything had vanished in smoke—

Sir Roger licked dry lips. "Tell him the Saracens must have landed, Brother Parvus," he said.

Huruga gave me no chance. Breast heaving with wrath, amber eyes turned blood-red, he stood shaking, pulled out his handgun again and screamed: "No more of this farce! Who else was with you? How many more spaceships have you?"

Sir Roger uncoiled himself, till he loomed above the stumpy Wersgorix like an oak on a heath. He grinned, touched his signet ring meaningfully and said: "Well, now, you can't expect me to reveal that. Perhaps I'd best return to my own camp, till your temper has cooled."

I could not phrase it so smoothly in my halting words. Huruga snarled: "Oh, no! Here you stay!"

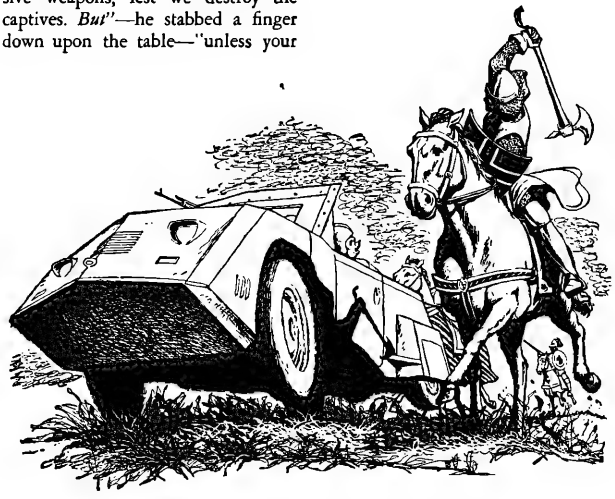
"I go." Sir Roger shook his close-cropped head. "Incidentally, if for any reason I don't return, my men have orders to kill all the prisoners."

Huruga heard me out. With a self-mastery I admired, he replied: "Go, then. But when you are back, we shall attack you. I do not propose to be caught between your camp on the ground and your friends in the sky."

"The hostages," Sir Roger reminded him.

"We shall attack," repeated Huruga doggedly. "It will be entirely with ground forces—partly to spare those same prisoners, and partly, of course, because every spaceship and aircraft must get aloft and search for those attackers of Stularax. We will

also refrain from using high-explosive weapons, lest we destroy the captives. *But*"—he stabbed a finger down upon the table—"unless your



weapons are far superior to what I think, we will overwhelm you with sheer numbers, if nothing else. I don't believe you even have any armored wagons, only a few light groundcars captured at Ganturath. Remember, after the battle, such of your folk as survive will be our prisoners. If you have harmed a single one of those Wersgorix you hold, your people will die, very slowly. If you yourself are caught alive, Sir Roger de Tourneville, you will watch all of them die before you do yourself."

The baron heard me render this for him. The lips were very pale in his sunburned face. "Well, Brother Parvus," he said in rather a small voice, "it's not worked out as well as I hoped—though perhaps not quite as badly as I feared. Tell him that if he will indeed let us two return safely, and confine his attack to ground forces, and avoid high-explosive shells, our hostages shall be safe from anything but his own fire."

He added wryly: "I don't think I could have made myself butcher helpless captives anyhow. But you need not tell him that."

Huruga merely jerked his head, an icy gesture, when I gave him the message. We two humans left, swung into the saddle and turned back. We

held our horses to a walk, to prolong the truce and the feel of sunlight on our faces.

"What happened at that Stularax castle, sire?" I whispered.

"I know not," said Sir Roger. "But I'll hazard that the bluefaces spoke truly—and I didn't believe it!—when they said one of their more powerful shells could wipe out an encampment. So the weapons we hoped to steal are gone. I can only pray that our poor raiders were not also caught in the blast. Now we can but defend ourselves."

He raised his plumed head. "Yet Englishmen have ever fought best with their backs to the wall."

XIII.

So we rode into camp, and my lord shouted haro as if this battle had been his dearest wish. In a great iron clangor, our folk went to their stations.

Let me describe our situation more fully. As a minor base, Ganturath was not built to withstand the most powerful forces of war. The lesser portion, which we occupied, consisted of several low masonry buildings arranged in a circle. Outside that circle were the armored emplacements of the fire-bombards; but these, being meant only to shoot upward at skycraft, were useless to us now. Underground was a warren of rooms and passages. There we put our children, aged, prisoners, and cattle, in charge of a few armed serfs. Such older people, or others not fit for combat, as were spry enough, waited near the middle of the buildings: prepared to carry off the wounded, fetch beer, and otherwise aid the fighting line.

This line stood on the side facing the Wersgor camp, just within the low earthen wall erected during the night. Their pikes, bills, and axes were reinforced at intervals by squads of bowmen. The cavalry poised at either wing. Behind them were the younger women and certain untrained men, who shared out our all too few pellet weapons; the force screen made fireguns useless.

Around us shimmered the pale heat-lightning of that shield. Behind us rose the ancient forest. Before us, bluish grass rippled down the valley, isolated trees soughed and clouds walked above the distant hills. It all had the eerie loveliness of a landscape in Faerie. Preparing bandages with the above-ground noncombatants, I wondered why there must be hatred and killing in so sweet a realm.

Flying craft thundered skyward and out of sight from the Wersgor camp. Our gunners dropped a few ere they were all gone. A number remained on the ground, held in reserve. They included some of the very largest transport ships. At the moment, however, my chief interest was the ground.

Wersgorix streamed forth, armed with long-barreled pellet weapons and in well-ordered squads. They did not advance in close ranks, but scattered as much as possible. Some of our folk let out a cheer at this, but I knew it must be their ordinary

ground-fighting tactics. When one has deadly rapid-fireguns, one does not attack in solid masses. Rather, one employs devices to take the enemy's guns out of action.

Such engines were in fact present. Doubtless they had been flown hither from the central bastion of Darova. There were two kinds of these horseless war-wagons. The most numerous sort was light and open, made of thin steel, holding four soldiers and a couple of rapid-fire weapons. They ran immensely fast and agile, like water beetles on four wheels. As I saw them whip and scream about, bouncing at a hundred miles an hour over broken terrain, I understood their purpose: to be so difficult to hit that most of them could work up to the very bombards of the foe.

However, these small cars hung back, covering the Wersgor infantry. The first line of actual attack was the heavy-armored vehicles. These moved but slowly for a powered machine, no faster than a horse could gallop. This was because of their size—big as a peasant's cottage—and the thick plating which could withstand all but a direct shellburst. With bombards projecting from their turrets, with their roaring and dust, they were like unto dragons. I counted more than twenty: massive, impervious, grinding forward on treads in a wide line. Where they had passed, grass and earth were smashed into stone-hard ruts.

I am told that one of our gunners, who had learned how to use the wheeled cannon which threw explosive shells, broke ranks and dashed for such a weapon. Sir Roger himself, now armed cap-a-pie, rode up and knocked him asprawl with his lance. "Hold on, there!" rapped the baron. "What're you about?"

"To shoot, sire," gasped the soldier. "Let's fire at 'em ere they break over our wall and—"

"If I didn't think our good yew bows could deal with such overgrown snails, I'd have you priming yon tube," said my lord. "But as it is, back to your pike!"

It had a salutary effect on the badly shaken spearmen, who stood with weapons grounded to receive that frightful charge. Sir Roger saw no reason to explain that—judging from what had happened at Stularax—he dared not use explosives at such short range, lest he destroy us, too. Of course, he should have realized that the Wersgorix would have many kinds of shell, of graded potency. But who can think of everything at once?

As it was, the drivers of those moving fortresses must have been surely puzzled that we did not fire on them, and wondered what we held in reserve. They found out when the first war-wagon toppled into one of our covered pits.

Two more were similarly trapped ere it was understood that these were no ordinary obstacles. Surely the good saints had aided us. In our ignorance, we had dug holes broad and deep, which by themselves would not have been escape-proof for such powerful vehicles. But then we added great

wooden stakes, almost by sheer habit, as if we expected to impale outsize horses. Some of these caught in the treads which girdled the wheels, and erelong those wheels were jammed tight with wood pulp.

Another wagon evaded the pits, which were not continuous. It approached the breastworks. A rapid-fire gun spat from it, seeking the range, and stitched small craters along our earth wall. "God send the right!" roared Sir Brian Fitz-William. His horse spurted from our lines, closely followed by half a dozen of the nearer cavalrymen. They galloped in a semicircle, just beyond reach of the gun. The vehicle lumbered in pursuit, seeking to bring its smallest-bore cannon to bear. Sir Brian got it headed the way he desired, winded his war-horn, and galloped back to shelter as the wagon plunged into a hole.

The war-turtles drew back. In that long grass, and with our cunning camouflage, they had no way of knowing where the other traps were. And these were the only such machines on all Tharixan, not to be lightly hazarded. We English had trembled lest they continue. Only one would have had to get through, to wipe us out.

Even though his information about us, our powers, and our possible spaceborne reinforcements was scanty, I think Huruga should have ordered the heavy wagons onward. Indeed, the Wersgor tactics were deplorable in all respects. But remember that for a long time they had not fought seriously on the ground. Their conquest of backward planets was a mere battue; their skirmishes with rival starfaring nations were mostly aerial.

Thus Huruga, discouraged by our pits but heartened by our failure to use low-power shellfire, withdrew the great cars. Instead, he sent the infantry and the light vehicles against us. His idea was plainly for them to find a path between our traps and mark it for the giant machines to follow.

The blue soldiers came at a run, scarcely visible through the tall grass, divided into little squads. I myself, being placed far back, saw only the occasional flash of a helmet, and the poles which they stuck up here and there to mark a safe channel for the heavy wagons. Yet I knew they numbered many thousands. My heart thudded within me and my mouth longed for a beaker of ale.

Ahead of the soldiers came racing the light cars. A few of them went into pits, and at such speeds were horribly wrecked. But most sped in a straight line—

Straight into the stakes we had planted in the grass near our breastworks, in case of a cavalry charge.

So fast were they traveling, the cars were almost as vulnerable to such defenses as horses would be. I saw one rise in the air, turn over, smash back to earth, and bounce twice ere it broke apart. I saw another impale itself, spout liquid fuel, and burst into flame. I saw a third swerve, skid, and crash into a fourth.

Several more, escaping the abatis, ran over the caltrops we had scattered

around. The iron spikes entered the soft rings encircling their wheels and were not to be gotten out. A car so injured could at best limp feebly from the battle.

Commands in the harsh Wersgor tongue must have rattled over the far-speaker. The majority of the open cars, still unscathed, ceased to mill about. They drew into a loose but orderly formation, and advanced at a walking pace.

Snap! went our catapults and *crash!* went our ballistae. Bolts, stones, and pots of burning oil hailed atrociously among the advancing vehicles. Not many were thus disabled, but their line wavered and slowed.

Then our cavalry charged.

A few of our horsemen died, caught in a storm of lead. But they had not far to gallop, to reach the enemy. Also, the grass fires started by our oil pots confused Wersgor vision with their heavy smoke. I heard a clang and boom as lances burst against iron sides, then had no more chance to watch that struggle. I know only that the lancers failed to disable any car with their shafts. However, it startled the drivers so much that these often failed completely to defend themselves against what followed. Rearing horses brought down hoofs, to crumple the thin steel plates; a few quick swipes of ax, mace, or sword emptied a vehicle of its crew. Some of Sir Roger's men used handguns to good effect, or small round shells which burst and scattered jagged fragments when thrown after a pin was released. The Wersgorix had similar weapons, of course, but less determination to use them.

The last cars fled in terror, hotly pursued by the English riders. "Come back, there!" bellowed Sir Roger at them. He shook the fresh lance given him by his esquire. "Come back, you caitiff rogues! Stand and deliver, you base-born heathen!" He must have been a splendid sight, gleaming metal and fluttering plumage and blazoned shield upon the restless coal-black stallion. But the Wersgorix were not a knightly folk. They were more prudent and forethoughtful than we. It cost them dearly.

Our horsemen must quickly retreat, for now the bluefoot was close, firing their guns as they pulled into larger masses for the assault on our breastworks. Armor was no protection, only a bright target. Sir Roger bugled his men to follow him, and they scattered out onto the plain.

The Wersgorix set up a defiant cheer and rushed. Across the seething confusion of our camp, I heard the archer captains howl their command. Then the gray goose flock went skyward with a noise as of mighty winds.

It came down, gruesomely, among the Wersgorix. While the first arrow flight was still rising, the second was on its way. A shaft with so much force behind it pierces the body and comes out on the other side with its broad cutting head all bloody. And now the crossbows, slower but still more powerful, began to mow down

the nearest attackers. I think that during those last few moments of their charge, the Wersgorix must have lost half their folk.

Nonetheless, dogged almost as Englishmen, they ran on to our very wall. And here our common men-at-arms stood to receive them. The women fired and fired, pinning down a goodly part of the foe. Those who came so close that guns were useless, must face ax, spear, billhook, mace, morningstar, dagger and broadsword.

Despite their awesome losses, the Wersgorix still outnumbered our folk two or three to one. Yet it was scarcely fair. They had no body armor. Their only weapon for such close-in fighting was a knife attached to the muzzle of the handgun, to make a most awkward spear . . . or the gun itself, clubbed. A few did carry pellet-firing sidearms,which caused us some casualties. But as a rule, when John Blueface fired at Harry Englishman, he missed even at pointblank range, in all that turmoil. Before John could fire again, Harry had laid him open with a halberd.

When our cavalry returned, striking the Wersgor infantry from the rear and hewing away, it was the end. The enemy broke and ran, trampling his own comrades in blind horror. The riders chased them, with merry hunting calls. When they were far enough away, our longbows cut loose once more.

Still many escaped who must otherwise have been spitted on a lance. For Sir Roger saw the heavy wagons trundling vengefully back and retreated with his folk. By God's mercy, I was so occupied caring for the wounded fetched to me that I knew nothing of that moment when our leaders thought we were undone after all. For the Wersgor charge had not gone for naught. It had succeeded in showing the turtle-cars how to avoid our pits. And now the iron giants came across a field turned into red mud, and naught we knew could stop them.

Thomas Bullard's shoulders slumped where he sat mounted near the baronial pennon. "Well," he sighed, "we gave what was ours to give. Now who will ride out with me to show them how Englishmen can die?"

Sir Roger's weary face drew into grave lines. "We've a harder task than that, friends," he said. "We were right to hazard our lives on a chance of victory. Now that we see defeat upon us, we've no right to throw those lives away. We must live—as slaves, if need be—so that our women and babes are not altogether alone on this hell-world."

"God's bones!" shouted Sir Brian Fitz-William. "Are you gone craven?"

The baron's nostrils flared. "You heard me," he said. "We stay here."

And then—lo! It was as if God Himself had come to deliver his poor sinful partisans. Brighter than lightning, a blue-white flash burst, several miles off in the forest. So lurid was the radiance that those few who chanced to be looking in that direc-

tion were blind for hours afterward. No doubt a great many Wersgorix were thus incapacitated, since their army faced it. The roar that followed knocked riders from their saddles and men from their feet. A wind swept us all, furnace hot, and carried tents before it like blown rags. Then, as that shattering wrath departed, we saw a cloud of dust and smoke arise. Shaped like an evil mushroom, it towered almost to heaven. Minutes passed before it began to dissipate; its upper clouds lingered for hours.

The charging war-cars ground to a halt. They knew, as we did not, what that burst signified. It was a shell of the ultimate potency, that destruction of matter which I cannot but feel to this day is an impious tampering with God's work, though my archbishop has cited me Scriptural texts to prove that any art is lawful if it be used for good purposes.

This was not a very strong shell, as such weapons go. It was meant to annihilate a half-mile circle, and produced comparatively little of those subtle poisons which accompany such explosions. And it had been fired distantly enough from the scene of action to harm no one.

Yet it put the Wersgorix in a cruel dilemma. If they used a similar weapon to wipe out our camp—if they overran us by any means—they might expect a hail of death. For the hidden bombard would have no further reason to spare the area of Ganturath. Thus they must suspend their assault upon us, until they had found and dealt with this new enemy.

Their war-wagons lumbered back. Most of the aircraft they had in reserve lifted and scattered widely, searching for whoever had fired that shell. The chief implement of this search was—as we knew from our own studies—a device embodying the same forces as are found in lodestone. Through powers which I do not understand, and have no desire to understand since the knowledge is unessential to salvation if not smacking of the black arts, this device could smell out large metallic masses. A gun big enough to fire a shell of the known potency should have been discovered by any aircraft flitting within a mile of its hiding place.

Yet no such gun could be located. After a tense hour, while we English watched and prayed on our walls, Sir Roger gusted a deep breath.

"I don't want to seem ungrateful," he said, "but I do believe God's helped us through Sir Owain, rather than directly. We ought to find his party somewhere out in the woods, even if those enemy fliers don't seem able to. Father Simon, you must know who the best poachers are in your parish—"

"Oh, my son!" exclaimed the chaplain.

Sir Roger grinned. "I ask for no secrets of the confessional. I'm only telling you to appoint a few . . . shall we say, skilled woodsmen? . . . to sneak their way through the grass into yon forest. Have them locate Sir Owain, wherever he is, and order him to hold his fire till I send word. You

needn't tell me who you appoint, Father."

"In that case, my son, it shall be as you command." The priest drew me aside and asked me to give spiritual comfort to the injured and frightened as his *locum tenens,* while he led a small scout party into the forest.

But my lord found another task for me. He and I and an esquire rode out under a white banner toward the Wersgor camp. We assumed the foe would have wit enough to understand our meaning, even if they did not use the same truce signal. And thus it was. Huruga himself drove out in an open car to meet us. His blue jowls looked shrunken, and his hands trembled.

"I call upon you to yield," said the baron. "Stop forcing me to destroy your poor benighted commoners. I pledge you'll all be treated fairly and allowed to write home for ransom money."

"I, yield to a barbarian like you?" croaked the Wersgor. "Just because you have some . . . confounded detection-proof cannon— No!" He paused. "But to get rid of you, I'll allow you to leave in the spaceships you've seized."

"Sire," I gasped when I had translated this, "have we indeed won escape?"

"Hardly," Sir Roger answered. "We can't find our way back, remember; and as yet, we dare not ask

for a skilled navigator to help us, or we'd reveal our weakness and be attacked again. Even if we did somehow win home, 'twould still leave this nest of devils free to plot a renewed assault on England. Nay, I fear that he who mounts a bear cannot soon dismount."

So with a heavy heart, I told the blue noble that we had come for more than some of his shoddy, old-fashioned spaceships, and if he did not surrender we would be forced to devastate his land. Huruga snarled for reply and drove back.

We also returned. Presently Red John Hameward came from the forest with Father Simon's party, which he had encountered on his way to our camp.

"We flew to that Stularax castle openly, sire," he related. "We saw other sky-boats, but none challenged us, taking us for a simple ship o' their own. Still, fortress sentries 'ud be warier, so we put down in a woods, a couple miles from the keep. We set up our trebuchet and put one o' those bursting shells in't. Sir Owain's idea was to lob a few to shake up their outer defenses. Then we'd slip closer afoot. We expected the garrison 'ud be scurrying about in search of our engine, and the curtain walls breached, at least; so we could dash in, kill whatever guards was left behind, lift what we could carry from the arsenal, and hie back to our boat."

At this point, since it is no longer used, I had best explain the trebuchet. It was the simplest but in many ways the most effective siege engine. In principle it was only a great lever, freely swinging on some fulcrum. The long arm ended in a bucket for the missile, while the short arm bore a stone weight, often of several tons. This latter was raised by pulleys or a winch, while the bucket was loaded. Then the weight was released, and in falling it swung the long arm through a mighty arc. The speed of the bucket, and hence the range of the casting, depended on the relative lengths to which the two lever arms were adjusted.

"I didn't think much o' those shells we had," Red John went on. "Why, the things didn't weigh no more'n five pounds. It hardly seemed worth the trouble of rigging the trebuchet. What could they do, I wondered, but burst with a silly little pop? I've seen trebuchets used proper, laying siege to French cities. We'd throw boulders of a ton or two, or sometimes dead horses, over the walls. But, well, orders was orders. So I m'self cocked the little shell like I'd been told how to, and we let fly. Whoom! The world blew up, like. I had to admit this was even better to throw nor a dead horse.

"Well, through the magnifying screens we could see the castle was pretty much flattened. No use raiding it now. We lobbed a few more shells to make sure it were reduced proper. Nothing there now but a big glassy pit. Sir Owain reckoned as we was carrying a weapon more useful nor any which we could o' lifted, and

I'd say he were right. So we landed in the woods some miles hence and dragged the trebuchet forth and set it up again. That's what took us so long, m' lord. When Sir Owain had seen from the air what was happening about that time, we fired a shell just to scarce the enemy a bit. Now we're ready to pound 'em as much as you wish sire."

"But the boat?" asked Sir Roger. "The foe have metal-sniffers. That's why they haven't found your trebuchet in the forest: it's made of wood. But surely they could discover your flying boat, wherever you've hid it."

"Oh, that, sire." Red John grinned. "Sir Owain's got our boat flitting up there 'mongst t'others. Who's to tell the difference in yon swarm?"

Sir Roger whooped laughter. "You missed a glorious fight," he said, "but you can light the balefire. Go back and tell your men to start shelling the enemy camp."

We withdrew underground at the agreed-on moment, as shown on captured Wersgor timepieces. Even so, we felt the earth shudder, and heard the dull roaring, as their ground installations and most of their ground machines were destroyed. A single shot was enough. The survivors thereof stormed in blind terror aboard one of the transport ships, abandoning much perfectly unharmed equipment. The lesser sky-craft were even quicker to vanish, like blown sea-scud. As the slow sunset began to burn in that direction we had wistfully named the west, England's leopards flew above England's victory.

XIV.

Sir Owain landed like some hero of a chanson come to earth. His exploits had not required much effort of him. While buzzing around in the middle of the Wersgor airfleet, he had even heated water over a brazier, and shaved. Lithely now he walked, head erect, mailcoat shining, red cloak aflutter in the wind. Sir Roger met him near the knightly tents, battered, filthy, reeking, clotted with blood. His voice was hoarse from shouting: "My compliments, Sir Owain, on a most noble and gallant action."

The younger man swept him a bow —and changed it most subtly to Lady Catherine's, as she emerged from our cheering throng. "I could have done no less," murmured Sir Owain, "with a bowstring about my heart."

The color mounted to her face. Sir Roger's eyes flickered from one to another. Indeed they made a fair couple. I saw his hands clench on the haft of his nicked and blunted sword.

"Go to your tent, madame," he told his wife.

"There is still work to do among the wounded, sire," she answered.

"You'll work for anyone but your own husband and children, eh?" Sir Roger made an effort to sneer, but his lip was puffy where a pellet had glanced off the visor of his helmet. "Go to your tent, I say."

Sir Owain looked shocked. "Those

are not words to address a gentlewoman with, sire," he protested.

"One of your plinking roundels were better?" grunted Sir Roger. "Or a whisper, to arrange an assignation?"

Lady Catherine grew quite pale. She took a long breath before words came. Silence fell upon those persons who stood within earshot. "I call God to witness that I am maligned," she said. Her gown streamed with the haste of her stride. As she vanished into her pavilion, I heard the first sob.

Sir Owain stared at the baron with a kind of horror. "Have you lost your senses?" he breathed at last.

Sir Roger hunched thick shoulders, as if to raise a burden. "Not yet. Let my captains of battle meet with me when they've washed and supped. But it might be wisest, Sir Owain, if you would take charge of the camp guard."

The knight bowed again. It was not an insulting gesture, but it reminded us all how Sir Roger had transgressed good manners. He departed and took up his duties briskly. A watch was soon set. Thereafter Sir Owain took Branithar on a walk around the blasted Wersgor camp, to examine that equipment which had been far enough away to remain usable. The blueface had—even during the past few busy days—picked up more English. He talked, lamely but with great earnestness, and Sir Owain listened. I glimpsed this in the last dull twilight, as I hurried to the conference, but could not hear what was being said.

A fire burned high, and torches were stuck in the ground. The English chieftains sat around the trestle table with alien constellations winking to life overhead. I heard night sought in the forest. All the men were deathly tired, they slumped on the benches, but their eyes never left the baron.

Sir Roger stood up. Bathed, clad in fresh though plain garments, a sapphire ring arrogant on one finger, he betrayed himself only by the dullness of his tone. Though the words were brisk enough, his soul was not in them. I glanced toward the tent where Lady Catherine and his children lay, but darkness hid it.

"Once again," said my lord, "God's grace has aided us to win. In spite of all the destruction we wrought, we've more booty of cars and weapons than we can use. The army that came against us is broken, and only one fortress remains on this entire world!"

Sir Brian scratched his white-bristled chin. "Two can play that game of tossing explosives about," he said. "Dare we remain here? As soon as they recover their wits, they'll find means to fire on us."

"True," Sir Roger's blond head nodded. "That's one reason we must not linger. Another being that it's an uncomfortable dwelling place at best. By all accounts, the castle at Darova is far larger, stronger, and better fitted. Once we've seized it, we need not fear shellfire. And even if Duke Huruga has no means left him whereby to bombard us here, we can be

sure he's now swallowed his pride and send spaceships off to other stars for help. We can look for a Wersgor armada to come against us." He affected not to notice the shudder that went among them, but finished, "For all these reasons, we want Darova for our own, intact."

"To stand off the fleets of a hundred worlds?" cried Captain Bullard. "Nay, now, sire, your pride has curdled and turned to madness. I say, let's get aloft ourselves while we can, and pray God that He will guide us back to Terra."

Sir Roger struck the table with his fist. The noise cracked across all forest rustlings. "God's wounds!" he roared. "On the day of a victory such as hasn't been known since Richard the Lion Heart, you'd tuck tail between legs and run! I thought you a man!"

Bullard growled deep in his throat, "What did Richard gain in the end, save a ransom payment that ruined his country?" But Sir Brian Fitz-William heard him and muttered low, "I'll hear no treason." Bullard realized what he had said, bit his lip and fell silent. Meanwhile Sir Roger hastened on:

"The arsenals of Darova must have been stripped for the assault on us. Now we have nearly all which remains of their weapons, and we've killed off most of its garrison. Give them time, and they'll rally. They'll summon franklins and yeomen from all over the planet, and march against us. But at this moment, they must be in one hurly-burly. The best they'll be able to do, is man the ramparts against us. Counterattack is out of the question."

"So shall we sit outside Darova's walls till their reinforcements come?" gibed a voice in the shadows.

"Better that than sit here, think you not?" Sir Roger's laugh was forced, but a grim chuckle or two responded. And so it was decided.

Our worn-out folk got no sleep. At once they must start their toil, by the brilliant double moonlight. We found several of the great transport aircraft which had been only slightly damaged, being on the fringes of the blast. The artisans among our captives repaired them at spearpoint. Into these we rolled all the weapons and vehicles and other equipment we could. People, prisoners, and cattle followed. Well before midnight, our ships had lumbered into the sky, guarded by a cloud of other vessels with one or two men aboard each. We were none too soon. Hardly an hour after our departure—as we learned later—unmanned fliers loaded with the strongest explosives rained down upon the site of Ganturath.

A cautious pace, through heavens empty of hostile craft, brought us over an inland sea. Miles beyond it, in the middle of a rugged and thickly forested region, we raised Darova. Having been summoned to the control turret to interpret, I saw it in the vision screens, far ahead and far below but magnified to our sight.

We had flown to meet the sun, and dawn glowed pink behind the build-

ings. These were only ten, low rounded structures of fused stone, their walls thick enough to withstand almost any blow. They were knitted together with reinforced tunnels. Indeed, nearly all that castle was deep underground, as self-contained as a spaceship. I saw an outer ring of gigantic bombards and missile launchers poke their snouts from sunken emplacements, and the force screen was up, like Satan's parody of a halo. But this seemed mere trimming on the strength of the fortress itself. No aircraft were visible, save our own.

By now I, like most of us, had had some instruction in the use of the far-speaker. I tuned it until the image of a Wersgor officer appeared in its screen. He had obviously been trying to tune in on me, so we had lost several minutes. His face was pale, almost cerulean, and he gulped several times before he could ask: "What do you want?"

Sir Roger scowled. Bloodshot, dark-rimmed eyes, in a face whose flesh seemed melted away by care, gave him a frightful appearance. I having translated, he snapped: "Huruga."

"We . . . we shall not surrender our grath. He told us so himself."

"Brother Parvus, tell that idiot I only want to talk to the duke! A parley. Haven't they any idea at all of civilized custom?"

The Wersgor gave us a hurt look, since I told him my lord's exact words, but spoke into a little box and touched a series of buttons. His image was replaced with that of Huruga. The governor rubbed sleep from his eyes and said with forlorn courage, "Don't expect to destroy this place as you did the others. Darova was built to be an ultimate strong point. The heaviest bombardment could only remove the aboveground works. If you attempt a direct assault, we can fill the air and the land with blasts and metal."

Sir Roger nodded. "But how long can you maintain such a barrage?" he asked mildly.

Huruga bared his sharp teeth. "Longer than you can mount the assault, you animal!"

"Nonetheless," Sir Roger murmured, "I doubt if you're equipped for a siege." I could find no Wersgor term in my limited vocabulary for that last word, and Huruga seemed to have trouble understanding the circumlocutions by which I rendered it. When I explained why it took me so long to translate, Sir Roger nodded shrewdly.

"I suspected as much," he said. "Look you, Brother Parvus. These starfaring nations have weapons nigh as powerful as St. Michael's sword. They can blow up a city with one shell, and lay waste a shire with ten. But this being so, how could their battles ever be prolonged? Eh? Yon castle is built to take hammer-blows. But a siege? Hardly!"

To the screen: "I shall establish myself nearby, keeping watch on you. At the first sign of life from your castle, I'll open fire. So 'twere best that your men stay underground all whiles. At any time you wish to sur-

render, call me on the far-speaker, and I'll be pleased to extend the courtesies of war."

Huruga grinned. I could almost read the thoughts behind that snout. The English were more than welcome to squat outside, till the avenging armada came! He blanked the screen.

We found a good campsite well beyond the horizon. It lay in a deep, sheltered valley, through which a river ran clean and cold and full of fish. Meadows were dotted throughout the forest; game was abundant, and off duty our men were free to hunt. For a few of those long days, I watched cheer blossom fresh among our people.

Sir Roger gave himself no rest. I think he dared not; for Lady Catherine left her children with their nurse and walked among bowers with Sir Owain. Not untended—they were careful of the proprieties—but her husband would glimpse them and turn to snarl a command at the nearest person.

Hidden away in these woods, our camp was safe enough from shellfire or missiles. Its tents and lean-tos, our weapons and tools, were not a large enough concentration of metal to be sniffed out by one of the Wersgor magnetic devices. Such of our aircraft as maintained watch on Darova, always landed elsewhere. We kept trebuchets loaded, in case any activity were revealed about the fortress; but Huruga was content to wait passive. Sometimes a daring enemy vessel passed overhead, having come from some other spot on the planet. But it never found any target for its explosives, and our own patrol soon forced it away.

Most of our strength—the great ships and guns and war-wagons—were elsewhere all this time. I myself did not see the hunting Sir Roger undertook. I stayed in camp, busying myself with such problems as teaching myself more Wersgor and Branithar more English. I also started classes in the Wersgor language for some of our more intelligent boys. Nor would I have wished to go on the baron's expedition.

He had spacecraft and aircraft. He had bombards to fire both flame and shell. He had a few ponderous turtle-cars. He had hundreds of light open battle-cars, which he hung with shields and pennons and manned with a cavalryman and four men-at-arms each. He went out across the continent and harried.

No isolated estate could withstand his attack. Looting and burning, he left desolation behind him. He killed many Wersgorix, but no more than necessary. The rest he stuffed captive into the huge transport ships. A few times, the franklins and yeomen tried to make a stand. They had hand-weapons only; his host scattered them like chaff and chivvied them across their own fields. It took him only a few days and nights to devastate the entire land mass. Then he made a quick foray across an ocean, bombed and flamed whatever he chanced upon, and returned.

To me it seemed a cruel butchery,

albeit no worse than this empire had done on many worlds. However, I own I have not always understood the logic of such things. Certainly what Sir Roger did was ordinary European practice in a rebellious province or a hostile foreign country. Yet when he landed in camp again, and his men swaggered forth loaded with jewels and rich fabrics, silver and gold, drunk on stolen liquor and boasting of what they had done, I went to Branithar.

"These new prisoners are beyond my power," I said, "but tell your brothers of Ganturath that before the baron can destroy them, he must take off my own poor head."

The Wersgor gave me a curious look. "What do you care for our sort?" he asked.

"God help me," I replied, "I do not know, save that He must also have made you."

Word of this reached my lord. He summoned me to the tent he now used instead of his pavilion. I saw forest glades choked with captives, milling about like sheep, mumbling and terrified under the English guns. True, their presence was a shield to us. Though the ships' descent must now have revealed our location closely enough to Huruga's magnifiers, Sir Roger had taken care that the governor knew what had happened. But I saw blueskin mothers holding little wailing blue cubs, and it was like a hand about my heart.

The baron sat on a stool, gnawing a haunch of beef. Light and shadow,

filtered through leaves, checkered his face. "What's this?" he cried. "Are you so fond of yon pigfaces you'll not let me have those we caught at Ganturath?"

I squared my skinny shoulders. "If nothing else, sire," I told him, "think how such a deed must harm your own soul."

"What?" He raised his thick brows. "When was it ever forbidden to set free the captive?"

My turn came to gape. Sir Roger slapped one thigh, guffawing.

"We'll keep some few, like Branithar and the artisans, who're useful to us. All the rest we'll herd to Darova. Thousands and thousands. Don't you imagine Huruga's heart will melt with gratitude?"

I stood there in sunlight and tall grass, while "Haw, haw, haw!" bellowed about me.

So under the jeers and spears-prods of our men, that uncounted throng stumbled through beck and brake, until they emerged on cleared land and saw the distant mass of Darova. A few stepped out of the crowd, timorous. The English leaned grinning on their weapons. One Wersgor began to run. No one fired at him. Another broke away, and another. Then the entire swarm of them pelted toward the fortress.

That evening Huruga yielded.

" 'Twas easy enough," Sir Roger chuckled. "I had him bottled up in there. I doubted he had more than just enough supplies, for siegecraft must be a lost art in this country. So, first, I showed him I could lay his whole planet waste—which he'd have to answer for even if we were conquered in the end. Then I gave him all those extra mouths to feed." He slapped my back. When I had been picked up and dusted off, he said, "Well, Brother Parvus, now that we own this world, would you like to head its first abbey?"

XV.

Of course I could not accept any such offer. Quite apart from all difficult questions of consecration, I hope I know my humble place in life. Anyhow, at this stage it was mere talk. We had too much else to do, to offer God more than a Mass of thanksgiving.

We let nearly all the recaptured Wersgorix go. On a powerful farspeaker, Sir Roger broadcast a proclamation to Tharixan. He bade every large landholder, in those areas not yet ravaged, to come make submission and take several of the homeless ones back with him. The lesson he had taught was so sharp that for the next few days it swarmed with blue visitors. I must needs deal with them, and forgot what sleep was like. But for the most part they were very meek. Indeed, this race had been supreme among the stars so long, that only their soldiers now had occasion to develop a manly contempt for death. Once these had submitted, the burgesses and franklin quickly did likewise—and were so used to having an all-powerful government above them,

that they never dreamed it might be possible to revolt.

Most of Sir Roger's attention in that period went to training his folk in garrison duty. The castle machines being as simple to operate as most Wersgor equipment, he had soon had women, children, serfs, and aged manning Darova. They should be able to hold it against attack for at least a while. Those who seemed hopelessly incapable in the diabolic arts of meter-reading, button-pushing, and knob-twisting, he put on a safely distant island to care for our livestock.

When transplanted Ansby was thus able to defend itself, the baron gathered his free companions for yet another expedition into the sky. He explained his idea to me beforehand: as yet, I alone had any fluency in the Wersgor tongue, though Branithar —with Father Simon's assistance— was instructing others apace.

"We've done well so far, Brother Parvus," Sir Roger declared. "But alone, we'd never hurl back the Wersgor hosts being raised against us. I hope by now you've mastered their writing and numerology. At least well enough to keep watch on a native navigator, and see that he doesn't steer us where we would not go."

"I have studied the principles of their star maps a little, sire," I answered. "Though in truth they do not employ charts, but mere columns of figures. Nor they have mortal steersmen on the spaceships. Rather, they instruct an artificial pilot at the start of the journey, and thereafter the homunculus operates the entire craft."

"How well I know that!" grunted Sir Roger. "'Twas how Branithar tricked us hither in the first instance. A dangerous wight, that, but too useful to kill. Glad I am not to have him aboard on this voyage; and yet I'm not easy in my heart at leaving him in Darova—"

"But where are you bound, sire?" I interrupted.

"Oh. Aye. That." He knuckled eyes sandy with weariness. "There are other kings than Wersgor. Lesser star-traveling nations, who dread the day when these snoutface fiends will decide to make an end of them. I shall seek allies."

It was an obvious enough move, but I hesitated. "Well?" demanded Sir Roger. "What ails you now?"

"If they have not yet gone to war," I said weakly, "why should the advent of a few backward savages like us make them do so?"

"Hearken, Brother Parvus," said Sir Roger. "I'm weary of this whining about our own ignorance and feebleness. We're not ignorant of the True Faith, are we? Somewhat more to the point, maybe, while the engines of war may change through the centuries, rivalry and intrigue look no subtler out here than at home. Just because we use a different sort of weapons, we aren't savages."

I could scarcely refute his argument, since it was our only hope except for a random flight in search of lost Terra.

The best spaceships were those

which had lain in the vaults of Darova. We were outfitting these, when the sun was darkened by a still greater vessel. As it hung up there like a thundercloud, it threw dismay among our folk. But Sir Owain Montbelle came running with a Wersgor engineer in tow, snatched up myself to interpret, and led us to the far-speaker. Standing out of sight of the screen, with sword drawn, Sir Owain made the captive speak with the master of the ship.

It proved to be a merchant craft, paying a regular call at this planet. The sight of Ganturath and Stularax turned into holes horrified its crew. We could easily enough have blasted the ship down, but Sir Owain used his Wersgor puppet to tell the captain there had been a raid from space, beaten off by the Darova garrison, and that he should land here. He obeyed. As the ship's outer portals opened, Sir Owain led a swarm of men aboard and captured it without trouble.

For this, they cheered him night and day. And he made a brave colorful figure, always prepared to fling a jest or a gallantry. Sir Roger, toiling without pause, grew ever more uncouth. Men stood in awe of him, and some little hatred, since he drove them to such exertions. Sir Owain contrasted, like Oberon versus a bear. Half the women must have been in love with him, though he had songs only for Lady Catherine.

The booty from the giant ship was rich. Best of all, however, were many tons of grain. We tried some of this on our livestock on the island, which was growing thin on the detested blue grass. They accepted the feed as eagerly as if it were English oats. When he heard this, Sir Roger exclaimed, "Whatever planet that comes from is the one we must capture next."

I crossed myself and hurried elsewhere.

But we had little time to lose. It was no secret that Huruga had dispatched spaceships to Wersgorixan immediately after the second battle of Ganturath. They would take a while to reach that distant planet, and the emperor would need a while more to raise a fleet among his widely scattered domains, and thereafter it would take time for the fleet to get back here. But already days had fled from us.

To head the Darova garrison of women, children, aged, and serfs, Sir Roger appointed his wife. I am told that our chronicler's practice of inventing speeches for the great persons whose lives they write, is unscholarly. Yet I knew those two, not just the haughty exterior but—in glimpses, for it was shy—the soul. I can all but see them, in a buried room of the alien castle.

Lady Catherine has hung it with her tapestries, spread rushes on the floor, and left the walls darkened in favor of sconced candles, that this place might seem less eerie to her. She waits in garments of pride, while her husband bids their children farewell. Little Matilda weeps openly.

Robert witholds the tears, more or less, until he has closed the door on his father; for he is a de Tourneville.

Slowly, Sir Roger straightens. He has stopped shaving, for lack of time, and the beard curls like wire on his scarred hooknosed face. The gray eyes look burnt out, and a muscle in his cheek will not stop twitching. Since hot water runs freely here from pipes, he has bathed; but he wears his usual rough old jerkin and patched hose. The baldric of his great sword creaks as he advances toward his wife.

"Well," he says awkwardly, "I must begone."

"Yes." Her back is slender and very straight.

"I believe—" He clears his throat. "I believe you've learned everything needful." When she does not answer: "Remember, 'tis most important to keep those students of the Wersgor tongue hard at their lessons. Otherwise we'll be deaf-mutes among our foes. But never trust our prisoners. Two armed men must always be with each one of them."

"Indeed," she nods. She is uncoifed, and candlelight slides along the coiled auburn hair. "I shall also remember that the pigs don't require that new grain we give the other animals."

"Most important! And be certain to stock this stronghold well. Those of our folk who have eaten native food are still in health, so you can requisition from Wersgor granaries."

Silence thickens about them.

"Well," he says, "I must begone."

"God be with you, my lord."

He stands a moment, studying each smallest tone in her voice. "Catherine—"

"Yes, my lord?"

"I've wronged you," he forces out. "And I've neglected you, what's worse."

Her hands reach out, as if of their own accord. His coarse palms close about them.

"Any man could be mistaken, now and then," she breathes.

He dares look into the blue eyes. "Will you give me a token?" he asks.

"For your safe return—"

He drops hands to her waist, draws her close and cries joyous: "And my final victory! Give me your token, and I'll lay this empire at your feet!"

She pulls herself free. Horror bestrides her lips. "When are you going to start looking for our earth?"

"What honor is there in slinking home, when we leave the very stars our enemies?" Pride clashes in his words.

"God help me," she whispers, and flees him. He stands a long while, until the sound of her feet has vanished down the cold corridors. Then he turns and walks out to his men.

We could have crowded into one of the big ships, but thought it best to disperse ourselves in a score. These had been repainted, using Wersgor supplies, by a lad who possessed some heraldic skill. Now they were scarlet and gold and purple, with the de Tourneville arms and the English leopards emblazoned on the flagship.

Tharixan fell behind us. We went into that strange condition, ducking in and out of more dimensions than Euclid's orderly three, which the Wersgorix called "super-light drive." Again the stars flamed on every hand, and we amused ourselves with naming the new constellations—the Knight, the Plowman, the Arbalest, and more, including some which are not fit to put in this record.

The voyage was not long: a few Earth-days only, as near as we could estimate from the clocks. It rested us, and we were keen as hounds when we coursed into the planetary system of Bodavant.

By now we understood that there are many colors and sizes of suns, all intermingled. The Wersgorix, like humans, favored small yellow ones. Bodavant was redder and cooler. Only one of its planets was habitable—the usual case—and while this Boda could have been settled by men or Wersgorix, they would find it dim and chilly. Thus our enemies had not troubled to conquer the native Jairs, but merely prevented them from acquiring more colonies than they had when discovered, and forced them into grossly unfavorable trade agreements.

The planet hung like a huge shield, mottled and rusty, against the stars, when the native warships hailed us. We brought our flotilla to an obedient halt. Rather, we ceased to accelerate, and simply plunged through space in a hyperbolic sub-light orbit which the Jair craft matched. But these problems of heavenly navigation make my poor head ache; I am content to leave them to the astrologers and the angels.

Sir Roger invited the Jair admiral aboard our flagship. We used the Wersgor language, of course, with myself as interpreter. But I shall only render the gist of the conversation, not the tedious byplay which actually took place.

A reception had been prepared, with an eye to impressing the visitors. The corridor from the portal to the refectory was lined with warriors. The longbowmen had patched their green doublets and hose, made their caps gay with feathers, and rested their dreadful weapons before them. The common men-at-arms had polished what mail and flat helmets they owned, and formed an arch of pikes. Beyond, where the passage grew high and broad enough to allow, twenty cavalrymen gleamed in full armor of plate, banner and scutcheon, plume and lance, astride our biggest chargers. At the final door, Sir Roger's huntmaster stood with hawk on wrist and a pack of mastiffs at his feet. Trumpets blared, drums rolled, horses reared, dogs gave tongue, and as one we made the ship roar with the deep-throated cry; "God and St. George for merry England! Haro!"

The Jairs looked rather daunted, but continued to the refectory. It was hung with the most gorgeous of our looted fabrics. At the end of the long table, Sir Roger, in broidered garments, surrounded by halberdiers and crossbowmen, sat on a throne hastily knocked together by our carpenters. As the Jairs entered, he raised

a golden Wersgor beaker and drank their health in English ale. He had wanted to use wine, but Father Simon had decided to reserve it for Holy Communion, pointing out that foreign devils wouldn't know the difference.

"Was hael!" declaimed Sir Roger, an English phrase he loved even when speaking his more usual French.

The Jairs hesitated, until page boys showed them to their places with as much ceremony as the royal court. Thereafter I said a prayer and asked a blessing upon the conference. This was not, I confess, done for purely religious reasons. We had already gathered that the Jairs employed certain verbal formulas to invoke hidden powers of body and brain. If they were benighted enough to take my sonorous Latin for a still more impressive version of the same thing, the sin was not ours, was it?

"Welcome, my lords," said Sir Roger. He, too, looked much rested. There was even a sparkle of deviltry about him. Only those who knew him well could have guessed what emptiness housed within. "I pray pardon for my unceremonious entrance into your domain, but the news I bear will scarcely wait."

The Jair admiral leaned tensely forward. He was a little taller than a man, though more slender and graceful, with soft gray fur over his body and a white ruff around his head. The face was cat whiskered and had enormous purple eyes, but otherwise looked human. That is to say, it looked as human as the faces in a triptych painted by a not very skillful artist. He wore close-fitting garments of brown stuff, with insignia of rank. But drab indeed they looked, he and his eight associates, next to the splendor we had scraped up. His name, we found later, was Beljad sor Van. Our expectation that the one in charge of interplanetary defenses would stand high in the government, proved well founded.

"We had no idea the Wersgorix would trust any other folk enough to arm them as allies," he said.

Sir Roger laughed. "Hardly, gentle sir! I am come from Tharixan, which I've just taken over. We're using captured Wersgor ships to eke out our own."

Beljad sat bolt upright. His fur bristled with excitement. "Are you another star-traveling race?"

"We hight Englishmen," Sir Roger evaded. He did not wish to lie to potential allies more than he must, for their indignation on discovering it might prove troublesome. "Our lords have extensive foreign possessions, such as Ulster, Leinster, Normandy—but I'll not weary you with a catalog of planets." I alone noticed he had not actually said those counties and duchies *were* planets. "To put it briefly, ours is a very old civilization. Our records go back for more than five thousand years."

Beljad was less impressed than we had expected. "The Wersgorix boast a mere two thousand years of clearly

established history, since their civilization rebuilt itself after its final internecine war," he said. "But we Jairs possess a reliable chronology for the past eight millennia."

"How long have you practiced space flight?" Sir Roger asked.

"For about two centuries."

"Ah. Our earliest experiments of that sort were . . . how long ago, would you say, Brother Parvus?"

"About thirty-five hundred years, at a place called Babel," I told them.

Beljad gulped. Sir Roger continued smoothly, "This universe is so large that the expanding English kingdom did not run into the expanding Wersgor domain until very recently. They didn't realize our true powers, but attacked us unprovoked. You know their viciousness. We're a very peaceful race ourselves." We had learned from contemptuous prisoners that the Jair Republic deplored warfare and had never colonized a planet which already had inhabitants. Sir Roger folded his hands and rolled his eyes upward. "Indeed," he said, "one of our most basic commandments is, 'Thou shalt not kill.' Yet it seemed a greater sin, to let so cruel and dangerous a power as Wersgorixan continue to ravage helpless folk."

"Hm-m-m." Beljad rubbed his furry brow. "Where does this England of yours lie?"

"Now, now," purred Sir Roger. "You can't expect us to tell even the most honored strangers that, until a better understanding has been reached. The Wersgorix themselves don't know, for we captured their scoutship. This expedition of mine has come hither to punish them and gather information. As I told you, we captured Tharixan with small loss to ourselves. But 'tis not our monarch's way to intervene in affairs that concern other intelligent species, without consulting their wishes. I swear King Edward III has never dreamed of doing so. I'd much prefer to have you Jairs, and others who've suffered at Wersgor hands, join me in a crusade to humble them. And thus you'll earn the right to divide up their empire with us."

"Are you . . . the head of a single military force . . . empowered to undertake such negotiations?"

"Sir, I am no petty noble," the baron answered with great stiffness. "My descent is as lofty as any in your realm. An ancestor of mine, by the name of Noah, was once admiral of the combined fleets of my planet."

"This is so sudden," Beljad faltered. "Unheard of. We cannot . . . I cannot . . . We must discuss . . ."

"Certes." My lord raised his voice till the chamber rang. "But don't dawdle overly long, gentles. I offer you a chance to help destroy the Wersgor barbarism, whose existence England can no longer suffer. If you'll share the burden of war, you'll share the fruits of conquest. Otherwise we English will be forced to occupy the entire Wersgor domain: for someone must keep order in it. So I say, join the crusade under my leadership, and haro for victory!"

TO BE CONCLUDED

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By P. SCHUYLER MILLER

NEW RESPECTABILITY

HIS may be the year in which science fiction again becomes respectable. If so, I think we can thank a small book by an English writer who happens to be one of the white-haired-boys of present-day serious literature—"New Maps of Hell," by Kingsley Amis (Harcourt, Brace and Co., New York. 161 pp. $3.95). This is by no means the first commentary on science fiction by a writer from outside the family, but it is—if we except Basil Davenport's "Inquiry into Science Fiction," which was almost straight exposition—the first critical study by an outsider who knows what he is talking about.

It may be that Mr. Amis will resent the "outsider" tag. He tells us that he has been reading it since he

was twelve, and that he did at least one science-fiction script—a poor one—for the British Broadcasting Corporation's Cultural Third Program. Still, he is known to the literary world outside our family circle as the author of "Lucky Jim" and a couple of other novels that took a keenly satiric look at life in modern England, a teacher of English at the University College of Swansea, Wales, a poet, and a lecturer. This book is expanded from a series of lectures he gave a year ago at Princeton—I imagine, to the amazement of all but a hard nucleus of students and unregenerate members of the science faculties who may have wandered into the room or heard via the grapevine what was going on.

Kingsley Amis is that delight to a downtrod clan, an influential friend in the critical court who knows us, understands us, likes us, and can appraise our faults and our strengths with a reasonable objectivity. In this, I think he is a fairer judge than some of the insiders who see themselves forever failing to write as well as they would like. On the subject of social commentary in science fiction, for example, he is quite at odds with the four writers—Robert Heinlein, C. M. Kornbluth, Robert Bloch and Alfred Bester—who have contributed to Advent's little book, "The Science Fiction Novel."

This is by no means a dead subject whether science fiction wanes or flourishes in 1960, and it will get a strong play at the Pittcon, the 18th World Science Fiction Convention, to be held at the Penn-Sheraton Hotel, Pittsburgh, over the coming Labor Day week end, September 3-6. James Blish, as Guest of Honor and principal dinner speaker, has selected as his topic "A Question of Content," which will be a serious appraisal of what science fiction should be about. Philip Jose Farmer is going to have at the question of sex in science fiction: "Are Science Fiction Readers Victorians?" Earl Kemp, one of the proprietors of Advent, hopes to enlist some of the members of Theodore Cogswell's Institute for 21st Century Studies—closest thing to a professional organization of science-fiction writers that exists—to discuss some of the answers he's been getting to his poll on "Who Killed Science Fiction?" And there will be more, formal and informal.

"New Maps of Hell" is a book you should read for yourself. Its arguments should not be represented by paraphrases, out-of-context quotations, and hasty summaries, which are all I can offer here. I must repeat again: it is a book by a man who knows good writing, and practices it himself, and who also knows science fiction—not just a few books by Wells, Verne, and the more reputable of the British practitioners, but pretty well the whole field, including the magazines. He has, however, simplified his task and lent strength to his argument by forcibly ruling out two whole areas that are usually lumped with science fiction: fantasy—which he doesn't like—and space opera,

which includes the bulk of the stuff that critics find unreadable.

Within these limits, Amis offers some broad judgments that are very like some I have proposed here: that science fiction has many interesting and competent practitioners, but no first rate writers in the literary sense . . . that we are naively self-conscious about our place in the literary world . . . that after deliberately separating ourselves from the main stream of modern literature, we are now drifting back to it . . . and that our interest to intellectual circles has been primarily as a symptom of social and psychological trends that they profess to see revealed in science-fiction themes and stereotypes.

I suspect that Amis overestimates the size of the science-fiction audience, which he sets at about half a million in the United States by assuming much more swapping-around of magazines than actually occurs. I think he underestimates our talent for straight-faced self-satire—or maybe I underestimate him—when he quirks an eyebrow at the name of The Elves', Gnomes' and Little Men's Science Fiction, Chowder and Marching Society. Probably England never knew "Barnaby" and Mr. O'Malley.

He seems also to be puzzled at the nostalgia for a rural way of life that he finds typical of much American science fiction, and especially of Clifford Simak among writers. Here I think he does have a valid characteristic by the ear without realizing it, for there is a century-old tradition in the United States that draws people away from the cities and into the country for holidays, for vacations, for relaxation of all sorts. My own boyhood dates back to the time when city relatives descended on the family farm every summer, in strict rotation, to do nothing more exciting than walk in the fields, grub in the garden, ride a hay-wagon, and make the weekly pilgrimage to town on Saturday night. I could also quote, if I hadn't lost 'em, impressive figures for the number of people who flock to state and national outdoor parks and campsites every year. Americans *do* look upon the country as good, and this attitude spills over into science fiction. On the other hand, our fantasy writers carry along the Old World tradition that the country is evil and dangerous.

Amis makes—and backs up—several other judgments that you may find controversial. Discussing standard themes, he suggests that science fiction may be a "hilariously unreliable" preview of future science, even in its most technical vein, but that it gives a much more reliable view of scientists' attitudes, such as the feeling that they alone are competent to run society. He finds our use of sex "rare, conventional and thin," but points out that science fiction is far more ready to theorize and debate sexual variety—recall C. S. Lewis' story about the "two nice girls" sent to minister to men on Mars?—than mainstream fiction, which is content to describe and view with horror.

You may want to argue, too, about the writer's judgment of your favorite

science-fiction authors. Robert Sheckley he characterizes as "science fiction's premier gadfly." Frederik Pohl he considers "the most consistently able writer science fiction, in the modern sense, has yet produced," and minimizes the part Kornbluth played in writing "The Space Merchants"—which, by the way, Ballantine has put back into print again with a nice cover quote to the effect that it "has many claims to being the best science-fiction novel so far," taken from this book.

Both pro and con Bradbury camps should enjoy the comment that of all science-fiction writers he is the one well known by name to those who know nothing whatever about the field, like Louis Armstrong in jazz. Bradbury, Amis maintains, has "that particular kind of sub-whimsical, would-be poetical badness that goes straight to the corny old heart of the Sunday reviewer."

But enough of the book itself: it's a must, if you are at all serious about science fiction. And it seems to me that it is already having its effect in intellectual circles. The book itself was widely reviewed in such magazines as *Saturday Review, The Nation*, and *Time*, which almost reversed its usual scoffing attitude. The reprinted paperback edition of "Space Merchants," with its Amis quote in nice red letters at the top of the front cover, I've already mentioned. And Ballantine has already brought out a paperback edition of a book that "New Maps of Hell" describes enthusiastically, though as fantasy rather than science fiction. What's more—and I think wholly because of the Amis plug—the austere New York *Times*, which never reviews science fiction these days if it can help it, gave the book a nice spot on pages 4 and 5 of the April 3rd Sunday *Book Review*, with a three-column illustration.

The book is "The Sound of His Horn" by an English writer who uses the pen-name "Sarban." Amis implies that he is a well-known English novelist; *Cumulative Book Index* says that he is John W. Wall, noted only for two other Sarban short-story collections, "Ringstones and Other Curious Tales," published in the United States in 1951 by Coward-Mc Cann, and long since out of print, and "Doll Maker and Other Tales of the Uncanny," published in England in 1953.

Kingsley Amis labels the book fantasy, primarily, I suppose, because its hero simply blanks out in wartime Germany and comes to in a world a century later, in which the Nazis have won. By my own standards, this is no more to be excluded than many another respectable story of alternate worlds. The book itself—only 124 pages—is very much in the John Buchan vein, drawing its baroque horror and eeriness from slight distortions of things we know.

Alan Querdilion, escaping from a prison camp somewhere in eastern Germany, runs into an electrified fence and comes to in a hospital on the preserve of Hans von Hackeln-

berg, Master Forester, in the hundred second year of the First German Millennium that was initiated by the War of German Rights. Little by little, the Graf's physician humoring him as an odd mental case, he is shown the tiny corner of the future in which he is trapped. It is a world deliberately thrown back into the Dark Ages of Germanic grandeur, in which men of non-Aryan races are bred and gelded as slaves, in which women are biologically converted and conditioned as hunting cats, and in which the game is human. In the end, as is inevitable from the first, Querdilion and the girl he has met in the forest are hunted down by Hackelnberg, his horn, and his squalling human cats.

The detail that builds up the picture of this grim future is calmly and minutely laid on—too calmly, I think, for the reader to get the full feeling of terror that he should. Still, it's another indication that mainstream writers are finding science fiction and fantasy a rewarding medium. Long may the trend continue!

One brief commercial, now. I've mentioned some of the highlight speakers at the Pittcon, the 18th World Science Fiction Convention, to be held in Pittsburgh, Pennsylvania. over the Labor Day week end. By the time you read this, the Pittcon Committee will have mailed two Progress Reports to those of you who have already registered. If you haven't, $2.00 sent to Dirce S. Archer, Pittcon Committee, 1453 Barnsdale Street, Pittsburgh 17, Pennsylvania, will get you both previous reports, a third in August, and the program booklet. And if you subscribe to Astounding/Analog, you should just have time to send us your votes for Best SF Novel, Best Shorter Story, Best Dramatic Program, Best Artist, Best Magazine, and Best Fanzine. The ballot must be postmarked before July 15th to be counted. Nominations closed May 1st, and a final ballot with the top candidates in each class went out with the second Progress Report. You don't have to use it, though and you don't have to register for the Convention to vote . . . if you do it before July 15th.

THE BIRD OF TIME, by Wallace West. Gnome Press, Hicksville, N. Y. 1959. 256 pp. $3.50

The copyright credits indicate that at least four stories, one of them here in 1936, have been rather skillfully woven together into this running chronicle of the conflict between the ancient feathered folk of Mars and the brash expansionists of Earth.

The best part of the book is the first, in which two would-be con-men from the First Martian Expedition return with a cargo of zircons that they hope to swap for Martian gold. Since the Martians need zircons, and have planted the suggestion in the first place, their scheme is not handicapped as much as you might suppose by the fact that the Martians are telepathic. Howbeit, while Jack Harkness woos the scarlet-winged Princess

Yahna and attempts to steal a teleport from the monstrous Avron, who controls Martian life from a lair near the South Pole, Bill Newsome devotes time and thought to outwitting Yahna's machinating fiancee, the Pitaret Mura, who has his own plans for the future of Earth.

Events are brought to a head by the terrible-tempered Colonel Brown, Keats-quoting head of the two Martian expeditions, and lead to a weird interplanetary war that is the theme of the second episode. Physically, little is going on but incessant skirmishing that is impoverishing both planets, but the Martians have developed mindcasts that are driving Earth's population violently nuts. Now Newsome is a UN censor, up to his ears in the mystery and counterplotting, while Harkness and Yahna are safely marooned on a planet of Polaris, quietly starving to death in the pleasant company of a transparent silica creature named Pog.

The mystery of the mindcasts is unraveled, Yahna rescued in time to help bring about a face-saving peace, and then in the final section Colonel Brown and Earth's bureaucrats set about worsening the ruin that is all that's left of human society. Now it's Jack Harkness' turn to be hero, as he returns from Polaris for an overdue order of groceries, to find the addled bureaucracy ridden hard by a bunch of even more addled psychiatrists.

The beautifully ethereal portrait of Yahna on the jacket does not set the mood of the book; it is entertainment from start to finish, with only snatches of the serious aspects of dying Mars and brash, bull-headed Earth. Even I can pick holes in the logic from time to time. But I'd rather go along with the author and enjoy the story.

THE BEST FROM FANTASY AND SCIENCE FICTION: NINTH SERIES, edited by Robert P. Mills. Doubleday & Co., Garden City, N.Y. 1960. 264 pp. $3.95

That these "best" collections are misnamed, I think their editors would be the first to agree. *Fantasy and Science Fiction* published a number of better stories in 1958 and 1959, but they might not have made as satisfactorily balanced a collection as this one, which almost by definition has become an annual bargain. This time there are sixteen stories, liberally interleaved with short verse, some of it serious, the rest merely delightful, and with excerpts from the outrageous punning adventures of "Ferdinand Feghoot."

Let me take the fantasies first—and if you are one of those who maintain that you can't stand the stuff, maybe these will show you that you're too dogmatic or ill-informed. From R. M. McKenna comes "Casey Agonistes," a story already meat for the anthologists, in which the patients in a dying men's ward imagine an ape as their companion. Its pathos is perfectly offset by the quirky humor of Walter S. Tevis' "Far From Home," with its whale in a desert swimming pool, and both are then swept aside by Avram

Davidson's "Dagon," which blends magic and realism in an inimitable way, using the sweet-and-sour principle for its portrait of a ruthless American in old China.

"Pact," by Winston P. Sanders, is a deft switch on the pact-with-a-demon theme, but Jane Rice's "The Willow Tree" is a fine ghost story with a modern turn and a grim ending. Finally, in "Ralph Wollstonecraft Hedge: A Memoir," Ron Goulart has contrived a devastatingly satiric pastiche of one of the many little essays from the H. P. Lovecraft circle.

The science fiction is just as varied —and as well done—as the fantasy. As a sheer tour de force, I suppose Robert A. Heinlein's "All You Zombies—" must be given first billing. He twists the basic time-travel paradox into a pretzel that makes his classic "By His Bootstraps" seem simple. Theodore Sturgeon comes up, in "The Man Who Lost the Sea," with a fine interplanetary story, quite different from anything he has been doing. Damon Knight's "What Rough Beast" is a little gem which spells out Mankind's unreadiness for great powers. Daniel Keyes' "Flowers for Algernon" is another classic-in-the-making, with a predictable variant on the enhanced-mental-power theme rescued by good writing.

In "A Different Purpose," Kem Bennett has the book's one piece of science-fictive realism. This is the straightforward story of the first Russian man-in-orbit, and of the brutally pragmatic way his govern-

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ment—and it might as well be ours—uses him. With "Eastward Ho!" William Tenn offers a delightful entertainment in a future in which the Indians are squeezing the last white off the Atlantic seaboard. There's humor, irony, and perception in it. "Soul Mate," by Lee Sutton, is a cruel little story of psi-linkage between a man and a girl; you may, for its ending, want to call it fantasy. George P. Elliott's "Invasion of the Planet of Love" is a bludgeoning commentary on conquering Mankind, and Joel Townsley Rogers' "No Matter Where You Go" offers a variation on what happens beyond the speed of light. Finally, Alfred Bester's "The Pi Man" is one of his zany experiments with plot and style that, this time, leaves me behind.

THE MARTIAN MISSILE, by David Grinnell. Avalon Books, New York. 1959. 224 pp. $2.95

Here's an old-fashioned yarn, right out of the Thirties, though the allusions are reasonably up to date.

Kermit Langley, a crook hiding out in the desert, rescues the pilot of an extraterrestrial rocket and is turned into an interplanetary unguided missile before the humanoid critter—from Thuban by way of Pluto—dies. He's had a message engraved on his armbone, and has four years to get it to Pluto, else he'll begin to vibrate until his bones fall apart. To make the mission not quite impossible, he's given the gift of unnoticeability. People—and things—can look right at him and not realize he's there.

Since the United States hasn't progressed far enough to help him, he unnoticeably heads for Russia, slips aboard a Lunik, throws the dogs and instruments out, and transships to a Thubanian scout craft waiting for him behind the Moon. Seems his vibrations are somehow transmitted through walls, space, and what have you, and serve as a beacon. Presently he is shot down on Mars, finds a millions-of-years dead city with a porcelain Easter-egg spaceship still working just fine, takes off with enemy needleships needling him, crashes again on Jupiter, is rescued by Jovians who embed him in Lucite (trademark, E. I. du Pont de Nemours Co.) and shoot him out of a cannon, gets "in tune" with the races of the Universe, and finally winds up in a free-for-all on Pluto where rival Thubanian and Altairean forces are waiting to take over Earth.

Hooboy!

THE FUNHOUSE, by Benjamin Appel. Ballantine Books No. 345K. 1959. 158 pp. 35¢

The author of this satire on our entertainment-oriented society has eleven "straight" novels and half a dozen other books to his credit. If he had sold his novel to a hardback publisher, he would undoubtedly be getting critical comparisons with Orwell and Huxley. Appearing as he has, in paper covers, he has sacrificed

the notice of the literary circle and thrown himself on our mercy. The mark here is "The Space Merchants" rather than "Brave New World."

The reaction may be wholly unjust, but I can't help feeling that there is a faintly patronizing tone to "The Funhouse," as if the author were trying to write down to the medium he is using. At best, this means lack of familiarity with science fiction as it is, and it certainly shows poor judgment, for no good writer should ever write worse than he can. It's too hard to do.

Appel's hero or at least protagonist, Crockett Smith, is Chief-of-Police on the Reservation to which a number of hard-shell Americans retired in 1979, when the two-hour work day became mandatory. In June of 2039 he is called to Washington by Law and Order Commissioner Elvis Sonata to find the A.I.D., a detonator with which a fanatic intends to blow up all the nuclear bombs in the world come July 4th. For some reason, the Think Machines that govern the "Funhouse"—as the world outside the Reservation is known—do not want Crockett on the job, but Elvis has gone over their mechanical heads to ask for help. Why is never quite clear, except that the Reservationist will not be bound by customs and conditionings that hamper the regular L and O operatives.

Telling his story later, presumably for his own people and for inclusion in a time capsule, Crockett lards his narrative liberally with footnotes—in this format, almost too fine to be read—and promises a set of appendixes that the author did not feel it necessary to append. Every facet of the Funhouse culture, every allusion, every twist of slang or jargon, is humorlessly spelled out in these interminable notes. They soon cease to be Crockett explaining his situation; they are the sniggering voice of the author, underlining his quips, and they get in the way of the story.

One of "us," I think, would have told the same story more deftly without this hobbling mechanism, and in the process would have emphasized the contrast between Crockett and the Funhousers, and pointed up the incongruities of that unhappy

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civilization of forcedly happy people. The details are more than fine, and the plot is reasonably sensible, although Crockett is dragged along toward a solution far more than he advances toward one. What might have been a cross between "Caves of Steel" and "Space Merchants" becomes neither, and the story turns into a series of set pieces that milk the last yok out of some distorted angle of the Pleasure State.

"The Funhouse" needs a Kornbluth.

PAPERBACK REPRINTS

STARSHIP, by Brian Aldiss. Signet Books, N.Y. No. S-1779. 160 pp. 35¢

An old theme made fresh by a talented British writer: warped societies evolve on the great interstellar ship that lost its way and purpose.

A MEDICINE FOR MELANCHOLY, by Ray Bradbury. Bantam Books, N.Y. No. A-2069. 183 pp. 35¢

All twenty-two stories from the Doubleday hardback edition. Not all are science fiction or fantasy.

THE DEVIL IN VELVET, by John Dickson Carr. Bantam Books, N.Y. No. F-2052. 312 pp. 50¢

This is a legitimate time-travel fantasy, enriched by the author's knowledge of London of 1675 and his skill as a mystery writer. Nicholas Fenton, Cambridge historian, goes back into the body of an ancestor to solve a two-hundred fifty-year-old murder.

ISLANDS IN THE SKY, by Arthur C. Clarke. Signet Books, N.Y. No. S-1769. 127 pp. 35¢

Reprint of a rather old—1952—Clarke juvenile about life in a space station. There should be more juveniles as good as this; on the other hand, the author has done the same sort of thing better for adults.

ALAS, BABYLON, by Pat Frank. Bantam Books, New York. No. F-2054. 279 pp. 50¢

A small community of people in Florida struggle to make a new way of life after atomic war has smashed the United States.

5 GALAXY SHORT NOVELS, edited by H. L. Gold. Perma Books, New York. No. M-4158. 292 pp. 35¢

The Doubleday edition was out in 1958. The five are "Tangle Hold," by F. L. Wallace; "World Without Children," by Damon Knight; "Wherever You May Be," by James E. Gunn; "Mind Alone," by J. T. McIntosh; and "Granny Won't Knit," by Theodore Sturgeon.

VISIT TO A SMALL PLANET, by Gore Vidal. Signet Books, N.Y. No. S-1788. 127 pp. 35¢

Praise be, this is the text of the original play—a success on television, Broadway, and in innumerable summer theaters—and not the abortion which Paramount has produced with Jerry Lewis.

THE END

(*Continued from page* 7)

Then there's South Africa, currently boiling lustily.

The real trouble is that the Lord was not as considerate as modern electronic component manufacturers, and people insist that he should have been. All the little one-half-watt resistors used in electronic gadgetry have the same external size, shape, and composition, whether they're 0.5 ohms or 50,000,000 ohms. You'd have to test each one individually, if you had a box of mixed resistors—and repair work would be hell. If the resistor's been overloaded, and now measures 30,000 ohms . . . wonder what it was supposed to be before it got burned?

Electronic manufacturers, unlike God, have color-coded their products. People insist that it was a mistake on God's part, and want to impose the color-coding system anyway.

Unfortunately, people are *not* color-coded. This is as hopelessly confusing to the Negro leaders in Africa as it is to the Whites. The Negro leader thinks, "I am Black; he is Black, therefore he is like me."

Human individuals differ as widely as electronic components; currently the South African Negro leaders are denying that, and treating their fellow Blacks in a viciously oppressive manner. The Whites are doing their best to help the Negroes against the oppression of the Negro leaders.

And that, of course, is why they are earning the violent hatred of all concerned—they're helping.

Before blasting off in any direction of righteous indignation; please note *exactly* what I am stating here:

1. That the Negro leaders are sincerely trying to help their fellow Negroes; to do so, they have organized squads to force the Negro workers to revolt, willy-nilly, or be beaten up by the squads.

   This, from the viewpoint of the Negro leaders, is precisely equivalent to Nasser's government sending in the Army to force the peasants to accept sanitation and education. It's raw, direct violence.

   It's intended to help.

2. And the White South Africans are sending in their police to protect the Negro workers, who want to get to work, from the direct violence of the organized squads.

   Naturally, the vast majority of the Negro workers are caught helplessly in the middle.

It makes a fascinating situation; the squads never attack the police—they attack, and threaten, the Negro workers. Hence they can claim that, so far as the police are concerned, their movement is "peaceful" and "nonviolent." The essentially disinterested mass of Negro workers—all they really want is peace-of-mind—are being shoved around, but genuinely do not intend violence.

But look—a head of thirty-thousand frightened sheep is lethally dangerous; they don't intend any violence whatever, simply escape. But God help anybody they escape over! A crowd of thirty-thousand peaceful-intentioned people can be, and re-

peatedly has been, utterly lethal. Most of the casualties in any mob-panic situation stem from people being trampled by the crowd. Snow sliding down a mountainside has no aggressive intent—but an avalanche is nearly irresistible.

I want to make it perfectly clear that I am not, in this discussion, concerned with who's right and who's wrong; that's one hundred per cent totally beside the point under discussion.

I want to clarify the fact that *helping hurts.* The Negro leaders may or may not be right; that we need not discuss. They are, however, sincerely trying to help their people. And they are most certainly causing pain.

The White South Africans, equally, are trying to help the Negro workers have free choice—to stop the organized squads seeking to drive the workers away from their jobs.

Who's right and who's wrong is, for this particular discussion, beside the point. Helping hurts. Therefore helpers are hated.

Incidentally, don't hold that if the Whites weren't resisting the efforts of the Negro leaders, there would be no painful situation. A certain amount of self-delusion and never-never-land dreaming is normal and expectable—but please; not that much! The Nasser government—and a thousand other governments in a thousand other times and places—has no racial problem, but has the very ancient human problem. The peasants want to continue their present way of life.

If the Whites withdrew totally, one hundred per cent, completely—or even went over one hundred per cent, all-out in full, willing co-operation with the Negro leaders—the major problem would remain.

They're dealing with a population largely composed of tribesmen, with ten thousand generations of tradition-dominated culture behind them. The tribesman-peasant-fellah type wants things to be stable, and stay in whatever form they now are.

It's not a matter of Black and White, or Red, Orange, Yellow, Green, Blue or Violet either; it's a simple matter of "I don't want change! I want peace of mind!"

The fellahin don't want their children educated, nor do they want to be made to dig wells where some stranger says. It takes an army, and raw, brute force, to make them do it.

In the various new Negro republics in Africa, the same problem exists—even though all White control has been totally withdrawn. There, the Negro leaders are gradually establishing hard-handed dictatorial-authoritarian regimes.

But at this point, the United States feels called on to criticize what the South African government is doing. It is, of course, immensely easier to *"tsk-tsk"* at someone using strong methods to solve a tough problem, than to offer a workable solution—but the United States is in a particularly unfortunate spot in that respect. We have problems of our own. And we're trying to convince people elsewhere that we don't.

And, of course, we're going to be the Big Help.

The Big Helper has invariably been cordially detested; it isn't going to do a bit of good to try to show the world at large that we're on the side of the races of color.

Color-coding again! Why must we be on the side of the races of color? What's color got to do with anything? Why not be on the side of wise men against fools, or honest men against thieves—and to hell with what color which is?

When democracy obviously and absolutely won't work— why be hypocritical and *tsk-tsk* at a wise group using authoritarian methods *wisely*.

And, moreover, *saying* we disapprove won't satisfy anyone, but will make everybody angry. The censured will naturally resent it; the other side will resent our failure to act—it will be held to show we don't really mean what we say—that we aren't *really* interested in helping. If the United States really meant it, we could make the South African government yield, couldn't we, huh? We made Britain and France back down on the Suez business, didn't we, huh? So . . . see! You don't *really* want to help!

Want, remember, is insatiable.

The United States has been the Big Help for some twenty years now. Before that time, the world wasn't much bothered with us—except, of course, South America, where we'd helped guarantee independence, and the Latin Americans, of course, loathed us. Now we're a Grade A villain, because everyone can see how wealthy and powerful we are, and how we could give them the help they want, if we weren't so selfish—such bloated, uncaring capitalists. Why, the United States spends $10,000,000 for just one bomber—or one missile that is blown to bits after twenty minutes use! We have surplus food stocks running out our ears—and yet the people of Urpistan are half starving and we won't give them any of the help they want.

We give Urpistan $25,000,000—are too niggardly to give the $50,000,000 they want—and therefore feel they need. They need $50,000,000 worth of food, so their people can live better—not that miserly $25,000,000 for an irrigation project. That simply means the poor, downtrodden Common Man is forced off the meager patch of ground his ancestors farmed for years beyond the memory of man. Not the food the people need—agriculture experts telling them how to farm, when they've been farming that land for umpteen centuries and know a lot more about it than some snobbish foreigner.

The people of Urpistan want what they want—not an education. They don't want roads; that means the government tax-collectors can get around faster. They want more rice and wheat, and particularly much more gin.

And they don't want corn, just because it will produce four times as much food-value per acre; they eat barley, and corn is an abomination.

In essence, the people of Urpistan want help in, and only in, exactly the terms *they* want help.

What they *need* is education—but remember that the essence of slavery is the emotionally painful situation of being compelled to learn something you do not choose to learn.

The United States would be far more cordially hated around the world if it weren't for our great and—unintentionally!—good friend, the Soviet Union. They're busily trying to help too. If the Urpistans of the world weren't so much afraid of the helpful Russians, they'd hate us twice as much.

Go on—let's see you figure out how to genuinely bring about improvement, genuine, positive improvement, without making the people feel oppressed! Give them the food they want; in five years their baby crop will have burgeoned and your wickedness will be evident when you refuse them the four times increased food shipment they now need. Food shipments, like morphine to an addict, requires ever increasing doses . . .

Or go ahead— figure out how to help the South Africans. Give the Negroes full political equality? Full voting equality in democratic, honest elections?

Friends, no one on the scene—neither Negro leaders nor Whites—would accept that proposition. They both know exactly what would happen, the still ninety per cent ritual-tabu, tradition-ruled tribesmen outnumber everybody else, and they'd vote for the sort of thing the Mau-Mau's have been fighting for. "Back to the Good Old Days!" They'd vote to destroy the police power that sought to impose sanitation. (They'd want the hospitals, of course, but not the industrial civilization that supports their medical science.)

Go ahead—imagine you're World Dictator, and impose the solution that's so badly needed. (But of course, you can't be allowed to have an army to protect you from the resultant hatreds.)

Really, the smart and easy solution is the old one: "Oh, a plague on both your houses!" Let them fight out their own intransigences. Each of the recently created African republics is busily doing just that now, with petty dictatorships clawing to establish themselves.

And, after taking a real good look at that—try asking yourself why those wiser, more experienced extra-solar aliens haven't made contact with us.

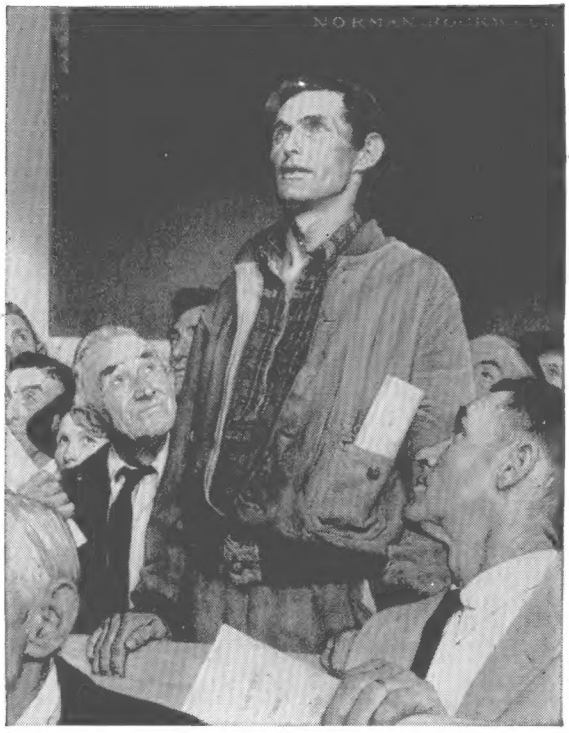
Look—they're supposed to be wiser and more experienced, aren't they? They should be foolish enough to stick their necks in? When the Big Help is positively, unqualifiedly guaranteed to be cordially hated by all concerned.

Aliens competent to run an interstellar civilization aren't such fools as to get in that bind. They've got more sense than to be the Big Help.

The Editor.

THE END

HELP US KEEP THE THINGS WORTH KEEPING



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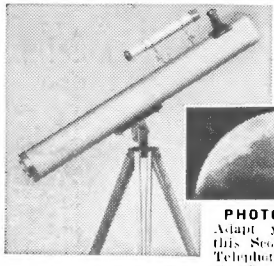

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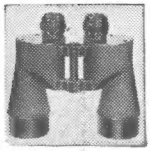

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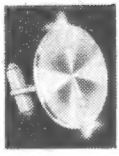

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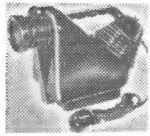

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